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November 7, 2013

North Carolina Department of Environmental and Natural Resources
Division of Waste Management
Solid Waste Section
1646 Mail Service Center
Raleigh, NC 27699-1649

Attn: Ms. Elizabeth Werner

Re: Closure Report for Beneficial Use Structural Fill
Marshall Steam Station
Catawba County, North Carolina
Record Number: CCB0072

Dear Ms. Werner,

Attached you will find the closure report for the Beneficial Use Structural Fill at Duke Energy, Marshall Steam Station. This report was completed by S&ME Engineering in accordance with 15A NCAC 13B.1706 – Closure of Structural Fill Facilities.

The intended beneficial use of landfill cell construction and operation will not be required within the time frame originally anticipated. Current facility landfill capacity will be analyzed annually based on landfill space constraints to determine when landfill construction will begin. Therefore, the Structural Fill area was covered with a temporary cover system consisting of 12 inches of compacted earth and 6 inches of soil capable of supporting native plant growth consistent with 15A NCAC 13B.1705. Landfill construction will proceed as documented in the PTC documents once the need arises

Please contact me if you have any questions or comments.

Respectfully submitted,

A handwritten signature in blue ink that reads "Kimberlee Hutchinson".

Kimberlee Hutchinson, PE
Environmental Services

Attachments: Structural Fill Closure Report, Industrial Landfill No. 1 Cells 3 and 4
Electronic Copy of Report

cc:

Dean Snyder, Duke Energy
George Tolbert, Duke Energy
Scott Parks, Duke Energy

STRUCTURAL FILL CLOSURE REPORT
DUKE ENERGY CAROLINAS, LLC – MARSHALL STEAM STATION
INDUSTRIAL LANDFILL NO. 1 – PHASE 1, CELLS 3 & 4
PERMIT NO. 1812
CATAWBA COUNTY, TERRELL, NORTH CAROLINA
S&ME Project No. 1356-11-032-06



Prepared for:
Duke Energy Carolinas, LLC
526 South Church Street
Charlotte, North Carolina 28202



Prepared by:
S&ME, Inc.
NC P.E. Firm License No. F-0176

9751 Southern Pine Boulevard
Charlotte, North Carolina 28273

November 2013



November 6, 2013

Cliffside Steam Station
573 Duke Power Road
Mooresboro, North Carolina 28114

Attention: Mr. Dean Snyder

Reference: **Cells 3 and 4 Structural Fill Closure Report – Permit ID No. 18-12**
Marshall Steam Station Industrial Landfill No. 1
Duke Energy Marshall Steam Station
8320 Highway 150 East, Terrell, Catawba County, North Carolina
S&ME Project No. 1356-11-032, Ph. 6
North Carolina P.E. Firm License No. F-0176

Dear Mr. Snyder:

S&ME is pleased to submit the *Cells 3 and 4 Structural Fill Closure Report* for the Marshall Steam Station Industrial Landfill No. 1 in Terrell, North Carolina. This certification report provides documentation that Cells 3 and 4 structural fill notification was constructed and closed in accordance with Section .1700 of the Solid Waste Rules, the enclosed project drawings and specifications, and related approved documents.

Please contact us should you have any questions or require additional information.

Respectfully Submitted,
S&ME, Inc.

I. Kyle Baucom, P.E.
Project Engineer
NC Registration No. 038555



Jason S. Reeves, P.E.
Senior Project Engineer
NC Registration No. 024486

Cc: Kim Hutchinson, Duke Energy
George Tolbert, Duke Energy
Scott Parks, Duke Energy



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1. PROJECT DESCRIPTION

1.1 Background

The Industrial Landfill No.1 is owned and operated by Duke Energy. The facility is located at Marshall Steam Station in Terrell, North Carolina. The Industrial Landfill No. 1 was permitted for Phase I (Cells 1 through 4) construction under Permit No. 18-12. Cells 1 and 2 are constructed and in the operations phase. The Cells 1 and 2 construction was documented in S&ME's "Cells 1 and 2 Construction Certification Report" dated January 31, 2011, and was approved in NCDENR's "Permit to Operate" dated March 7, 2011.

Remaining consistent with the Permit To Construct (PTC) and other documents submitted to NCDENR, Phase 1 of the landfill development has been planned in the following six stages:

- Stage 1: Cells 1 and 2 subgrade preparation (clearing and grubbing);
- Stage 2: Structural Fill to Cells 1 and 2 subgrade (compliant with .1700 rule regulations);
- Stage 3: Cells 1 and 2 construction and operation;
- Stage 4: Cells 3 and 4 subgrade preparation (clearing and grubbing);
- Stage 5: Structural Fill to Cells 3 and 4 subgrade (compliant with .1700 rule regulations); and,
- Stage 6: Cells 3 and 4 construction and operation.

At the time of this report, Stages 1, 2, 4, and 5 are complete, and Stage 3 is currently ongoing. Structural fill notification was provided for both Stages 2 and 5 .1700 Rules fill in the "Structural Fill Facility Notification" dated May 29, 2010, and a subsequent update for Stage 5 construction was provided in the "Structural Fill Facility Notification Update" dated March 16, 2012. Within these previous reports, the siting criteria for the structural fill was discussed in detail and in general accordance with 15A NCAC 13B.1704. The report herein is being prepared to document the completion of Stage 5 construction consistent with 15A NCAC 13B.1705 and 15A NCAC 13B.1706.

During Stage 5 construction, it was determined that the future Stage 6 landfill cell construction and operation will not be required within the time frame originally anticipated. The landfill capacity will be analyzed annually based on landfill space constraints to determine when future Stage 6 construction will begin. Therefore, Stage 5 construction area was covered with a temporary cover system consisting of 12 inches of compacted earth and 6 inches of soil capable of supporting native plant growth consistent with 15A NCAC 13B.1705. Stage 6 construction will proceed as documented in the PTC documents once the need arises.

This report is intended to document the completion of Stage 5 construction in general accordance with 15A NCAC 13B.1705, and the temporary closure of the structural fill in general accordance with 15A NCAC 13B.1706. Pertinent CQA documentation, including

earthworks field and laboratory test results, record drawings, and project documentation are included in the Appendices.

1.2 Design and Operations

The structural fill was designed, operated, and constructed utilizing various environmental protection controls. Ash was moisture conditioned, collected, and transported to the site in a manner that prevented nuisances and hazards to public health and safety. Ash was generated on-site and was transported solely on Duke Energy property to the site. Once the ash material was placed, water trucks were regularly utilized to moisture condition the ash for both dust control, as well as to aid in meeting the compaction and moisture requirements for material placement.

During operations, surface water runoff was diverted away from the active ash placement areas to aid in minimizing erosion and sedimentation. Prior to the commencement of construction, an Erosion and Sediment Control (E&SC) Plan was prepared and approved by NCDENR Land Quality Section to minimize erosion, sedimentation, and stormwater runoff discharges. In addition, stormwater runoff discharges were contained within Duke Energy property and ultimately conveyed to a discharge point at the existing ash basin (NPDES Permit #NC004987).

1.3 Construction

Construction generally consisted of earthworks activities largely involved excavation and placement of subgrade fill, structural fill soil cover, and topsoil/vegetative soil cover. Subgrade fill was performed in accordance with .1700 rules by the SEFA Group beginning in April 2012 and ending in March 2013. Subgrade fill placement was performed in accordance with .1700 rules by Charah beginning April 27, 2012 and ending September 12, 2013. Subgrade filling operations performed by SEFA were monitored by S&ME, while subgrade fill operations performed by Charah were monitored by ESP Associates (ESP). Subgrade fill was placed in uniform and compacted one-foot thick lifts to meet the compaction and moisture requirements. The southern perimeter subgrade fill slopes were constructed at approximate 3 horizontal to 1 vertical (3H:1V).

Structural fill soil cover and topsoil/vegetative soil cover placement was performed by Charah beginning August 5, 2013 and ending October 16, 2013. S&ME monitored construction activities and provided testing services during structural fill soil cover and topsoil/vegetative soil cover placement. Construction activities are discussed in further detail in subsequent sections of this report.

1.4 Closure

As previously mentioned, the structural fill was covered with a temporary cover system consisting of 12 inches of compacted earth and 6 inches of soil capable of supporting native plant growth consistent with 15A NCAC 13B.1705. Once the need for full-scale landfill construction arises, the structural fill will be permanently covered with a double liner system consistent with the approved PTC documents.

To prevent ponding of surface water, stormwater drainage generally slopes at a 4 percent slope across the top deck area to a diversion channel that conveys flow from the north end of the site to a down drain at the south end of the site. To minimize erosion, the site was stabilized with erosion control matting, vegetation, and riprap.

1.5 Certification

Observation and testing results by S&ME, Inc. and review of observation and testing results by others indicated that the structural fill closure was completed in general accordance with the .1700 rules and project documents. A Construction Certification Statement signed and sealed by the Engineer of Record for the design and construction, a registered Professional Engineer in the State of North Carolina, is included as an upfront document in this report.

2. CONSTRUCTION

Earthworks construction activities included excavation and placement of three different material types: subgrade fill; structural fill soil cover; and topsoil/vegetative soil cover. Material descriptions and general construction procedures for the three material types are summarized in Sections 2.1 through 2.3. Earthworks construction observation and testing activities are summarized in Section 2.4.

2.1 Subgrade Fill

The subgrade fill material definition and subgrade fill general construction procedures are summarized in this section. Observation and testing results are reported in Section 2.4.

2.1.1 Material

Subgrade fill is defined as compacted fill placed to achieve proposed liner system subgrade elevations. Subgrade fill primarily consisted of conditioned ash from the silos near the plant.

2.1.2 Construction

Subgrade fill was performed in accordance with .1700 rules by the SEFA Group beginning in April 2012 and ending in March 2013. Subgrade filling was performed in accordance with .1700 rules by Charah beginning in April 2013 and ending in September 2013. Based on the comparison of pre- and post- topographic surveys, approximately 340,853 cubic yards of material were placed to complete the Cells 3 and 4 subgrade fill. The subgrade fill was compacted to meet the requirements specified in the referenced notification. The southern perimeter subgrade fill slopes were constructed at approximate 3 horizontal to 1 vertical (3H:1V).

2.2 Structural Fill Soil Cover

The structural fill soil cover material definition and general construction procedures are summarized in this section. Observation and testing results are reported in Section 2.4.

2.2.1 Material

Structural fill soil cover is defined as compacted soil required for perimeter berms, surface water control systems, and the lower 12 inches of the structural fill cover system. Structural fill consisted of on-site borrow soils that were free of organic material, refuse or debris.

2.2.2 Construction

Structural fill construction for Cells 3 and 4 was performed by Charah beginning August 14, 2013 and ending October 16, 2013. Based on the comparison of pre- and post- topographic surveys, approximately 14,998 cubic yards of soil were placed as structural fill soil cover for Cells 3 and 4 construction. The structural fill was compacted to meet the specified project requirements. The majority of structural fill was constructed as the lower 12 inches of the structural fill cover system.

2.3 Topsoil/Vegetative Soil Cover

The topsoil/vegetative soil cover material definition and general construction procedures are summarized in this section. Observation and testing results are reported in Section 2.4.

2.3.1 Material

Topsoil/vegetative soil cover is defined as soil fill placed within the upper 6 inches of the structural fill cover system. Topsoil/vegetative soil cover consisted of on-site borrow soil that is free of refuse or debris.

2.3.2 Construction

Topsoil/vegetative soil cover construction for Cells 3 and 4 was performed by Charah during September and October 2013. Based on the comparison of pre- and post-topographic surveys, approximately 8,298 cubic yards of soil were placed as topsoil/vegetative soil cover for Cells 3 and 4 construction.

2.4 Observation & Testing

S&ME and ESP observed, monitored, and provided field and laboratory testing during earthworks construction on a part-time basis for the cover system. Borrow soils used during construction were monitored to evaluate that the materials conformed to the project specifications.

Field and laboratory testing were performed at the specified frequencies summarized in this section. Field and laboratory testing frequency requirements are stated per volume of material and are based on lift area and thickness requirements provided in the specifications. Tables 1 and 2 summarize frequency verification for field and laboratory testing of earthworks.

2.4.1 Field Observation & Testing - Subgrade and Structural Fill

Field testing consisted of performing field density tests using the drive cylinder method (ASTM D2937) and moisture content tests (ASTM D2216). S&ME monitored subgrade fill operations from April 2012 through March 2013 and cover system structural fill placement from August 2013 through October 2013. ESP monitored subgrade fill operations from April 2013 through July 2013. Field density tests were performed at the following frequency with the specified moisture-density requirements:

Soil Type	Frequency	Moisture Requirement	Density Requirement
Subgrade Fill	1 test per 5,000 CY	$\pm 3\%$ of OMC ²	95% Standard Proctor MDD ³
Structural Fill	1 test per 807 CY ¹	$\pm 3\%$ of OMC ²	95% Standard Proctor MDD ³

¹Frequency based on one test every lift 43,560 square feet in area, and with a thickness of 0.5 feet

²Optimum moisture content as determined by standard Proctor (ASTM D698) testing

³Maximum dry density as determined by standard Proctor (ASTM D698) testing

Field density test results for the subgrade and structural fill are included in Appendix I, Sections 1 and 2, respectively.

The field density tests were compared with standard Proctor tests performed previously on similar materials to estimate relative compaction of the material at the tested locations. During the initial stages of subgrade fill placement, the field density tests were compared with standard Proctor tests performed previously on material placed in Cells 1 and 2 during landfill operations (S-1 through S-6). As subgrade fill progressed, the field density tests were compared with standard Proctor tests performed on material placed in the Cells 3 and 4 structural fill (SG-1 through SG-18). The laboratory test results are included in Appendix I, Section 1.

Ninety-three (93) field density tests were performed on the subgrade fill that met both density and moisture requirements. An additional thirteen (13) field density tests met density requirements, but were slightly outside the project moisture requirements. Those tests were accepted, since the density requirements were met. Referencing Table 1, the number of passing tests exceeded the sixty-nine (69) tests required to meet the specified frequency.

Twenty-one (21) field density tests were performed on the structural fill that met both density and moisture requirements. Referencing Table 1, the number of passing tests exceeded the nineteen (19) tests required to meet the specified frequency.

Based on in-place material quantities, the number of passing field tests, as reported in Table 1, met the required testing frequencies for the subgrade and structural fill placement.

2.4.2 Laboratory Testing (Subgrade and Structural Fill)

Subgrade fill testing was generally performed at a frequency of one suite of tests per 20,000 cubic yards and structural fill laboratory testing was performed at a frequency of approximately one suite of tests per 10,000 cubic yards of material placed.

In general, each suite of tests included the following:

- Water (Moisture) Content (ASTM D2216);
- Particle Size (ASTM D422);
- Liquid Limit, Plastic Limit, and Plasticity Index (ASTM D4318); and
- Standard Proctor Compaction (ASTM D698).

Laboratory test results for the subgrade and structural fill are included in Appendix I, Sections 1 and 2, respectively. The subgrade laboratory test results are provided in Appendix I, Section 1. The quantity of subgrade and structural fill material placed and the number of laboratory tests conducted are reported in Table 2.

Approximately 340,853 cubic yards of subgrade fill were placed. To meet the specified frequency of 1 suite of tests per 20,000 cubic yards of material, 17 tests would be required. Eighteen (18) test suites were performed on the subgrade material; therefore, the specified testing frequency was met.

Approximately 14,998 cubic yards of structural fill soil cover were placed. To meet the specified frequency of 1 suite of tests per 10,000 cubic yards of material, two (2) tests would be required. Seven (7) test suites were performed on the structural fill soil cover; therefore, the specified frequency was met.

2.4.3 Field Observation & Testing (Topsoil/Vegetative Soil Cover)

S&ME observed and monitored during topsoil/vegetative soil cover construction on a part-time basis. Topsoil/vegetative soil cover was observed to verify that the material was refuse and debris.

The structural fill cover system soil cover thickness of 18 inches was also verified through surveying. The thickness was verified by comparing the elevations of subgrade (top of ash) survey points with cover system (top of soil) survey points at similar northing and easting locations and calculating the elevation difference. WSP provided survey data that was obtained on an approximate 100-foot by 100-foot grid with individual survey points also obtained at slope breaks. Soil cover thickness verification as-built drawings and summary tables are included in Appendix I, Section 3. The thickness verification data indicates that the minimum 18-inch thick soil cover thickness was achieved.

2.4.4 Laboratory Testing (Topsoil/Vegetative Soil Cover)

Topsoil/vegetative soil cover laboratory testing was performed to obtain soil amendment recommendations for seeding over the cover system.

Laboratory test results for the topsoil/vegetative soil cover are included in Appendix I, Section 3.

3. PROJECT DOCUMENTATION

Construction activities and project progress were documented throughout construction. While on site, S&ME engineering staff and technicians observed and documented construction activities as summarized in daily field reports and photographs. The project documentation information and project drawings and specifications are included in Appendix II.

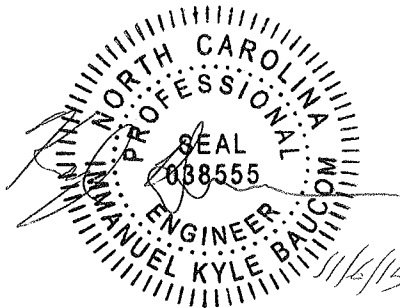
**CONSTRUCTION CERTIFICATION STATEMENT
FOR
DUKE ENERGY – MARSHALL STEAM STATION
INDUSTRIAL LANDFILL NO. 1
CELLS 3 AND 4 STRUCTURAL FILL CLOSURE REPORT**

OWNER: DUKE ENERGY
OPERATOR: DUKE ENERGY

by:

S&ME, Inc.
9751 Southern Pine Boulevard
Charlotte, North Carolina 28273-5560

I hereby certify that the results of periodic construction quality assurance (CQA) activities conducted by S&ME Inc. and review of testing by others, as summarized in this report, indicate that the Marshall Steam Station Industrial Landfill No. 1 Cells 3 and 4 structural fill (NCDENR #CCB0072) was constructed and closed in general accordance with the requirements of Section .1700 of the Solid Waste Rules and the project drawings and specifications.



I. Kyle Baucom, P.E.
N.C. Registration No. 038555

TABLE 1
EARTHWORKS FIELD TESTING FREQUENCY VERIFICATION

DESCRIPTION	TEST STANDARD	CELLS 3 AND 4 IN-PLACE VOLUME ESTIMATE (CY)	PROJECT SPECIFICATIONS	FIELD TEST FREQUENCY (1 test per X CY)	NUMBER OF TESTS IN CELLS 3 AND 4	
					REQUIRED	PASSING
Subgrade Fill (.1700 Rules Fill)						
Nuclear or Drive-Cyliner Density	ASTM D 6938 or ASTM D 2937	340,853	95% Standard Proctor MDD	5,000	69	92
Moisture Content	ASTM D 2216		+ or - 3% of OMC			92
Structural Fill						
Nuclear or Drive-Cyliner Density	ASTM D 6938 or ASTM D 2937	14,998	95% Standard Proctor MDD	807 ¹	19	21
Moisture Content	ASTM D 2216		+ or - 3% of OMC			21

1. Frequency based on 1 test every lift 43,560 square feet in area, and with a thickness of 0.5 feet.

TABLE 2
EARTHWORKS LABORATORY TESTING FREQUENCY VERIFICATION

DESCRIPTION	TEST STANDARD	CELLS 3 AND 4 IN-PLACE VOLUME ESTIMATE (CY)	LAB TEST FREQUENCY (per CY)	NUMBER OF TESTS IN CELLS 3 AND 4	
				REQUIRED	PASSING
Subgrade Fill (.1700 Rules Fill)					
Moisture Content	ASTM D 2216	340,853	20,000	17	18
Grain-size with Hydrometer	ASTM D 422			17	18
Atterberg Limits	ASTM D 4318			17	18
Standard Proctor	ASTM D 698			17	18
Structural Fill					
Moisture Content	ASTM D 2216	14,998	10,000	2	7
Grain-size with Hydrometer	ASTM D 422			2	7
Atterberg Limits	ASTM D 4318			2	7
Standard Proctor	ASTM D 698			2	7

APPENDIX I – EARTHWORKS

Section 1 – Subgrade

Section 2 – Structural Fill Soil Cover

Section 3 – Topsoil/Vegetative Soil Cover



APPENDIX I – EARTHWORKS

Section 1 – Subgrade

Subgrade Fill Field Density Test Results

Subgrade Fill Laboratory Test Results

Cells 1 & 2 Operations Laboratory Test Results

Final Subgrade As-Built Drawing

Subgrade Fill Field Density Test Results





Summary of Density Test Results

Page No. 1

Report Date: November 06, 2013

Project No.: 1356-11-032SG

Project Name: Marshall Ind.LF #1-Cells 3-4Co

Client: Duke Energy, Post Office Box 37929, 8320 Highway 150 East, Terrell, North Carolina 28682

Test		In-Place Density Test			Check Plug Data		Reference Standard				Compaction		Location	Elevation or Stone Depth
No.	Date	Type	Dry Density	Moisture Content	Dry Density	Moisture Content	Type	Ref. Curve	MDD	Optimum Moisture Content	Percent Specified	Percent In-Place		
1	05/17/12	D 2937	82.4	28.7	76.7	21.4	698CP	SG-1	79.5	26.3	95	100+	C2	
2	05/17/12	D 2937	80.5	23.4	76.7	21.4	698CP	SG-1	79.5	26.3	95	100+	D2	
3	05/17/12	D 2937	81.7	26.9	76.7	21.4	698CP	SG-1	79.5	26.3	95	100+	D3	
4	05/21/12	D 2937	73.8	25.0	71.4	22.9	698CP	S-4	75.8	27.7	95	97	B4	
5	05/21/12	D 2937	76.8	27.4	72.8	23.3	698CP	S-4	75.8	27.7	95	100+	C4	
6	05/21/12	D 2937	78.6	30.0	75.9	25.1	698CP	S-5	77.4	27.8	95	100+	C3	
7	05/23/12	D 2937	76.4	29.4	71.5	20.9	698CP	S-4	75.8	27.7	95	100+	C2	
8	05/23/12	D 2937	73.7	27.8	72.7	22.2	698CP	S-4	75.8	27.7	95	97	D2	
9	05/23/12	D 2937	68.4	28.6	67.0	21.1	698CP	S-1	73.2	32.8	95	93 *	D3	
10	05/23/12	D 2937	73.0	30.4	72.7	22.2	698CP	S-4	75.8	27.7	95	96	Retest of #9	
11	05/29/12	D 2937	73.9	26.8	72.5	24.7	698CP	S-6	74.7	29.5	95	99	C4	
12	05/29/12	D 2937	75.2	29.3	71.8	22.5	698CP	S-4	75.8	27.7	95	99	D4	
13	05/29/12	D 2937	74.2	28.0	71.8	22.5	698CP	S-4	75.8	27.7	95	98	C3	
14	06/01/12	D 2937	72.4	31.9	70.9	26.3	698CP	S-1	73.2	32.8	95	99	C4	
15	06/01/12	D 2937	70.9	30.7	70.9	26.3	698CP	S-1	73.2	32.8	95	97	D4	
16	06/01/12	D 2937	74.4	34.5	70.8	28.5	698CP	S-1	73.2	32.8	95	100+	C3	
17	06/01/12	D 2937	73.3	33.2	70.8	28.5	698CP	S-1	73.2	32.8	95	100	D3	
18	06/15/12	D 2937	76.0	25.2	74.0	22.9	698CP	S-5	77.4	27.8	95	98	C2	
19	06/15/12	D 2937	76.6	26.1	74.0	22.9	698CP	S-5	77.4	27.8	95	99	D2	

* = Failed Specified Compaction, ** = Failed Specified Moisture Content

All Test Locations and Elevations are Approximate

Notes:

References: ASTM D 2937: Density of Soil In Place by the Drive Cylinder Method, 698CP: MDD determined by check plug in accordance with S&ME procedure WI-TP-698-CP-REV2.

Distribution: Dean Snyder/Duke Energy

Kyle Baucom/S&ME, Inc.

Name (Technical Responsibility)

Signature

Project Engineer

Position



Summary of Density Test Results

Page No. 2

Report Date: November 06, 2013

Project No.: 1356-11-032SG

Project Name: Marshall Ind.LF #1-Cells 3-4Co

Client: Duke Energy, Post Office Box 37929, 8320 Highway 150 East, Terrell, North Carolina 28682

Test		In-Place Density Test			Check Plug Data		Reference Standard				Compaction		Location	Elevation or Stone Depth
No.	Date	Type	Dry Density	Moisture Content	Dry Density	Moisture Content	Type	Ref. Curve	MDD	Optimum Moisture Content	Percent Specified	Percent In-Place		
20	07/05/12	D 2937	74.5	22.2	73.8	20.8	698CP	S-2	77.5	27.0	95	96	C2	
21	07/05/12	D 2937	75.4	27.8	71.8	20.0	698CP	S-4	75.8	27.7	95	99	C3	
22	07/05/12	D 2937	74.6	26.5	71.8	20.0	698CP	S-4	75.8	27.7	95	98	C4	
23	07/12/12	D 2937	73.8	27.3	68.8	21.3	698CP	S-6	74.7	29.5	95	99	B3	
24	07/12/12	D 2937	74.7	28.2	68.8	21.3	698CP	S-6	74.7	29.5	95	100	B4	
25	07/23/12	D 2937	76.8	27.4	72.3	20.5	698CP	SG-2	77.0	27.7	95	100	B-1	
26	07/23/12	D 2937	74.1	26.0	73.0	23.9	698CP	S-4	75.8	27.7	95	98	B-2	
27	07/23/12	D 2937	77.1	28.7	72.3	20.5	698CP	SG-2	77.0	27.7	95	100	B-3	
28	07/23/12	D 2937	74.7	27.0	73.0	23.9	698CP	S-4	75.8	27.7	95	99	B-4	
29	07/30/12	D 2937	72.1	27.9	71.1	23.8	698CP	S-6	74.7	29.5	95	97	B1	
30	07/30/12	D 2937	74.0	29.8	71.1	23.8	698CP	S-6	74.7	29.5	95	99	B2	
31	07/30/12	D 2937	74.1	28.6	71.1	23.8	698CP	S-6	74.7	29.5	95	99	C2	
32	08/15/12	D 2937	74.6	25.6	73.6	25.6	698CP	SG-2	77.0	27.7	95	97	D3	
33	08/15/12	D 2937	76.2	30.5	73.1	23.7	698CP	SG-2	77.0	27.7	95	99	D4	
34	09/11/12	D 2937	75.0	27.8	74.2	26.6	698CP	S-4	75.8	27.7	95	99	C1	
35	09/11/12	D 2937	75.5	28.9	74.2	26.6	698CP	S-4	75.8	27.7	95	100	D1	
36	09/13/12	D 2937	72.8	27.1	70.6	23.4	698CP	SG-6	74.5	29.5	95	98	B1	
37	09/13/12	D 2937	73.6	27.7	70.6	23.4	698CP	SG-6	74.5	29.5	95	99	C2	
38	09/13/12	D 2937	75.0	29.1	72.7	26.4	698CP	SG-6	74.5	29.5	95	100+	D2	

* = Failed Specified Compaction, ** = Failed Specified Moisture Content

All Test Locations and Elevations are Approximate


Notes:

References: ASTM D 2937: Density of Soil In Place by the Drive Cylinder Method, 698CP: MDD determined by check plug in accordance with S&ME procedure WI-TP-698-CP-REV2.

Distribution: Dean Snyder/Duke Energy

Kyle Baucom/S&ME, Inc.

Name (Technical Responsibility)


Signature

Project Engineer

Position



Summary of Density Test Results

Page No. 3

Report Date: November 06, 2013

Project No.: 1356-11-032SG

Project Name: Marshall Ind.LF #1-Cells 3-4Co

Client: Duke Energy, Post Office Box 37929, 8320 Highway 150 East, Terrell, North Carolina 28682

Test		In-Place Density Test			Check Plug Data		Reference Standard				Compaction		Location	Elevation or Stone Depth
No.	Date	Type	Dry Density	Moisture Content	Dry Density	Moisture Content	Type	Ref. Curve	MDD	Optimum Moisture Content	Percent Specified	Percent In-Place		
39	09/13/12	D 2937	75.2	28.6	72.7	26.4	698CP	SG-6	74.5	29.5	95	100+	C3	
40	09/13/12	D 2937	75.4	30.4	72.7	26.4	698CP	SG-6	74.5	29.5	95	100+	D3	
41	09/21/12	D 2937	73.6	26.1	70.3	20.5	698CP	SG-2	77.0	27.7	95	96	D1	
42	09/21/12	D 2937	74.0	22.1	70.3	20.5	698CP	SG-2	77.0	27.7	95	96	D2	
43	09/21/12	D 2937	75.1	27.3	70.3	20.5	698CP	SG-2	77.0	27.7	95	98	D3	
44	09/21/12	D 2937	79.1	29.7	74.8	20.8	698CP	SG-3	78.9	26.9	95	100	D4	
45	09/21/12	D 2937	73.6	25.3	70.3	20.5	698CP	SG-2	77.0	27.7	95	96	Retest of Tests #42	
46	09/28/12	D 2937	77.0	24.5	73.9	19.5	698CP	SG-1	79.5	26.3	95	97	D4	
47	09/28/12	D 2937	75.4	23.8	73.9	19.5	698CP	SG-1	79.5	26.3	95	95	D3	
48	09/28/12	D 2937	77.4	25.1	73.9	19.5	698CP	SG-1	79.5	26.3	95	97	D2	
49	10/03/12	D 2937	76.1	24.0	74.8	24.0	698CP	SG-3	78.9	26.9	95	96	D3	
50	10/03/12	D 2937	78.3	27.3	77.3	23.6	698CP	SG-1	79.5	26.3	95	99	D4	
51	10/03/12	D 2937	77.0	25.3	74.8	24.0	698CP	SG-3	78.9	26.9	95	98	C3	
52	10/03/12	D 2937	78.5	26.9	77.3	23.6	698CP	SG-1	79.5	26.3	95	99	C4	
53	10/08/12	D 2937	78.5	27.9	74.3	22.5	698CP	SG-3	78.9	26.9	95	99	C3	
54	10/08/12	D 2937	78.9	28.2	74.3	22.5	698CP	SG-3	78.9	26.9	95	100	C4	
55	10/08/12	D 2937	75.3	31.0	71.6	24.6	698CP	SG-6	74.5	29.5	95	100+	B4	
56	10/22/12	D 2937	78.2	25.3	74.8	20.0	698CP	SG-8	78.9	25.8	95	99	C3	
57	10/22/12	D 2937	75.6	24.4	73.0	21.3	698CP	SG-3	78.9	26.9	95	96	D3	

* = Failed Specified Compaction, ** = Failed Specified Moisture Content

All Test Locations and Elevations are Approximate

Notes:

References: ASTM D 2937: Density of Soil In Place by the Drive Cylinder Method, 698CP: MDD determined by check plug in accordance with S&ME procedure WI-TP-698-CP-REV2.

Distribution: Dean Snyder/Duke Energy

Kyle Baucom/S&ME, Inc.

Name (Technical Responsibility)


Signature

Project Engineer

Position



Summary of Density Test Results

Page No. 4

Report Date: November 06, 2013

Project No.: 1356-11-032SG

Project Name: Marshall Ind.LF #1-Cells 3-4Co

Client: Duke Energy, Post Office Box 37929, 8320 Highway 150 East, Terrell, North Carolina 28682

Test		In-Place Density Test			Check Plug Data		Reference Standard				Compaction		Location	Elevation or Stone Depth
No.	Date	Type	Dry Density	Moisture Content	Dry Density	Moisture Content	Type	Ref. Curve	MDD	Optimum Moisture Content	Percent Specified	Percent In-Place		
58	10/22/12	D 2937	75.5	23.8	73.0	21.3	698CP	SG-8	78.9	25.8	95	96	D4	
59	10/22/12	D 2937	77.9	25.1	74.8	20.0	698CP	SG-8	78.9	25.8	95	99	C4	
60	11/01/12	D 2937	78.7	25.2	77.1	23.6	698CP	SG-1	79.5	26.3	95	99	C1	
61	11/01/12	D 2937	82.2	23.8	77.1	23.6	698CP	SG-1	79.5	26.3	95	100+	C1	
62	11/01/12	D 2937	81.7	25.3	77.1	23.6	698CP	SG-1	79.5	26.3	95	100+	C1	
63	11/01/12	D 2937	81.5	24.2	77.1	23.6	698CP	SG-1	79.5	26.3	95	100+	C1	
64	11/01/12	D 2937	79.5	25.7	77.1	23.6	698CP	SG-1	79.5	26.3	95	100	C1	
65	11/01/12	D 2937	79.6	25.2	77.1	23.6	698CP	SG-1	79.5	26.3	95	100	C1	
66	12/11/12	D 2937	74.4	25.5	70.8	26.2	698CP	SG-6	74.5	29.5	95	100	D2	
67	12/11/12	D 2937	72.8	21.6	73.0	20.3	698CP	SG-2	77.0	27.7	95	95	D2	
68	12/11/12	D 2937	76.0	19.3	74.4	19.7	698CP	SG-3	78.9	26.9	95	96	D2	
69	12/11/12	D 2937	73.7	19.8	74.6	20.0	698CP	SG-3	78.9	26.9	95	93 *	D3	
70	12/11/12	D 2937	71.7	19.7	73.0	20.0	698CP	SG-2	77.0	27.7	95	93 *	D3	
71	12/11/12	D 2937	73.6	19.6	73.0	20.0	698CP	SG-2	77.0	27.7	95	96	D3	
72	12/11/12	D 2937	73.4	22.4	74.6	20.0	698CP	SG-3	78.9	26.9	95	93 *	Retest of Test #69	
73	12/11/12	D 2937	74.1	22.0	73.0	20.0	698CP	SG-2	77.0	27.7	95	96	Retest of Test #72	
74	12/27/12	D 2937	80.6	28.1	80.6	24.3	698CP	SG-4	81.7	25.3	95	99	D3	
75	12/27/12	D 2937	83.8	28.8	80.6	24.3	698CP	SG-4	81.7	25.3	95	100+	D3	
76	12/27/12	D 2937	75.9	18.8	77.3	23.0	698CP	SG-1	79.5	26.3	95	95	D3	

* = Failed Specified Compaction, ** = Failed Specified Moisture Content

All Test Locations and Elevations are Approximate

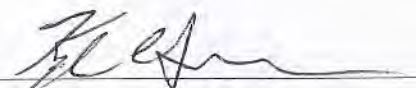
Notes:

References: ASTM D 2937: Density of Soil In Place by the Drive Cylinder Method, 698CP: MDD determined by check plug in accordance with S&ME procedure WI-TP-698-CP-REV2.

Distribution: Dean Snyder/Duke Energy

Kyle Baucom/S&ME, Inc.

Name (Technical Responsibility)


Signature

Project Engineer

Position



Summary of Density Test Results

Page No. 5

Report Date: November 06, 2013

Project No.: 1356-11-032SG

Project Name: Marshall Ind.LF #1-Cells 3-4Co

Client: Duke Energy, Post Office Box 37929, 8320 Highway 150 East, Terrell, North Carolina 28682

Test		In-Place Density Test			Check Plug Data		Reference Standard				Compaction		Location	Elevation or Stone Depth
No.	Date	Type	Dry Density	Moisture Content	Dry Density	Moisture Content	Type	Ref. Curve	MDD	Optimum Moisture Content	Percent Specified	Percent In-Place		
77	12/27/12	D 2937	80.8	25.4	77.3	23.0	698CP	SG-1	79.5	26.3	95	100+	C2	
78	12/27/12	D 2937	77.8	28.1	77.3	23.0	698CP	SG-1	79.5	26.3	95	98	C2	
79	12/27/12	D 2937	79.5	29.1	77.3	23.0	698CP	SG-1	79.5	26.3	95	100	C2	
80	12/27/12	D 2937	76.8	20.1	77.3	23.0	698CP	SG-1	79.5	26.3	95	97	Retest of Test #76	
81	01/31/13	D 2937	81.2	22.7	82.7	22.9	698CP	SG11	84.2	24.0	95	96	C2	
82	01/31/13	D 2937	77.0	23.2	82.5	22.1	698CP	SG11	84.2	24.0	95	91 *	C2	
83	01/31/13	D 2937	75.5	21.8	82.5	22.1	698CP	SG11	84.2	24.0	95	90 *	C3	
84	01/31/13	D 2937	77.4	22.1	80.6	22.4	698CP	SG11	84.2	24.0	95	92 *	D3	
85	01/31/13	D 2937	76.4	18.0	79.1	17.5	698CP	SG11	84.2	24.0	95	91 *	D2	
86	01/31/13	D 2937	79.2	20.7	79.1	17.5	698CP	SG11	84.2	24.0	95	94 *	D3	
87	02/06/13	D 2937	83.2	22.0	81.4	21.5	698CP	SG11	84.2	24.0	95	99	Retest of Test No. 82, C2	
88	02/06/13	D 2937	81.2	20.9	81.4	21.5	698CP	SG11	84.2	24.0	95	96	Retest of Test No. 83, C3	
89	02/06/13	D 2937	84.1	25.1	81.4	21.5	698CP	SG11	84.2	24.0	95	100	Retest of Test No. 86, D3	
90	02/06/13	D 2937	84.5	21.1	81.4	21.5	698CP	SG11	84.2	24.0	95	100	Retest of Test No. 85, D2	
91	02/06/13	D 2937	83.0	22.9	81.4	21.5	698CP	SG11	84.2	24.0	95	99	Retest of Test No. 84, D3	
92	02/27/13	D 2937	86.5	27.5	86.8	20.0	698CP	SG14	88.8	21.6	95	97	C3	
93	02/27/13	D 2937	89.8	24.0	86.8	20.0	698CP	SG14	88.8	21.6	95	100+	C3	
94	02/27/13	D 2937	92.1	21.8	86.8	20.0	698CP	SG14	88.8	21.6	95	100+	D3	
95	02/27/13	D 2937	83.7	21.5	82.4	23.1	698CP	SG11	84.2	24.0	95	99	C2	

* = Failed Specified Compaction, ** = Failed Specified Moisture Content

All Test Locations and Elevations are Approximate

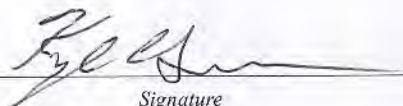
Notes:

References: ASTM D 2937: Density of Soil In Place by the Drive Cylinder Method, 698CP: MDD determined by check plug in accordance with S&ME procedure WI-TP-698-CP-REV2.

Distribution: Dean Snyder/Duke Energy

Kyle Baucom/S&ME, Inc.

Name (Technical Responsibility)


Signature

Project Engineer

Position



Summary of Density Test Results

Page No. 6

Report Date: November 06, 2013

Project No.: 1356-11-032SG

Project Name: Marshall Ind.LF #1-Cells 3-4Co

Client: Duke Energy, Post Office Box 37929, 8320 Highway 150 East, Terrell, North Carolina 28682

Test		In-Place Density Test			Check Plug Data		Reference Standard				Compaction		Location	Elevation or Stone Depth
No.	Date	Type	Dry Density	Moisture Content	Dry Density	Moisture Content	Type	Ref. Curve	MDD	Optimum Moisture Content	Percent Specified	Percent In-Place		
96	02/27/13	D 2937	84.7	24.0	82.4	23.1	698CP	SG11	84.2	24.0	95	100+	C2	
97	02/27/13	D 2937	84.6	22.7	82.4	23.1	698CP	SG11	84.2	24.0	95	100	D2	
98	03/15/13	D 2937	80.2	21.6	81.5	21.4	698CP	SG11	84.2	24.0	95	95	C2	
99	03/15/13	D 2937	82.6	22.3	81.5	21.4	698CP	SG11	84.2	24.0	95	98	C2	
100	03/15/13	D 2937	87.3	23.1	82.8	16.3	698CP	SG14	88.8	21.6	95	98	C2	
101	03/15/13	D 2937	89.3	23.5	82.8	16.3	698CP	SG14	88.8	21.6	95	100+	C2	
102	03/15/13	D 2937	85.0	22.5	82.8	16.3	698CP	SG14	88.8	21.6	95	96	C2	
103	03/15/13	D 2937	81.7	21.3	81.5	21.4	698CP	SG11	84.2	24.0	95	97	C2	
104	04/30/13	D 2937	67.0	22.2	70.3	20.3	698CP	SG-6	74.5	29.5	95	90 *	C1	
105	04/30/13	D 2937	66.4	21.9	70.3	20.3	698CP	SG-6	74.5	29.5	95	89 *	C1	
106	05/17/13	D 2937	83.0	21.4	85.7	21.1	698CP	SG13	86.7	22.7	95	96	D2	
107	05/17/13	D 2937	68.1	22.8	69.9	23.6	698CP	SG-5	72.6	32.2	95	94 *	D2	
108	05/17/13	D 2937	72.5	28.5	73.0	25.3	698CP	SG-6	74.5	29.5	95	97	D2	
109	05/17/13	D 2937	81.6	20.1	84.5	20.7	698CP	SG13	86.7	22.7	95	94 *	D2	
110	05/17/13	D 2937	69.5	22.4	69.9	23.6	698CP	SG-5	72.6	32.2	95	96	Retest of Test 107; D2	
111	05/17/13	D 2937	83.4	22.6	84.5	20.7	698CP	SG13	86.7	22.7	95	96	Retest of Test 109; D2	
112	05/17/13	D 2937	78.0	22.7	79.0	21.5	698CP	SG10	80.7	25.1	95	97	D1	
113	05/17/13	D 2937	74.7	24.6			698CP	SG3	78.9	26.9	95	95	D1	
114	05/17/13	D 2937	75.1	24.0			698CP	SG-3	78.9	26.9	95	95	D1	

* = Failed Specified Compaction, ** = Failed Specified Moisture Content

All Test Locations and Elevations are Approximate

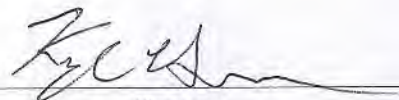
Notes:

References: ASTM D 2937: Density of Soil In Place by the Drive Cylinder Method, 698CP: MDD determined by check plug in accordance with S&ME procedure WI-TP-698-CP-REV2.

Distribution: Dean Snyder/Duke Energy

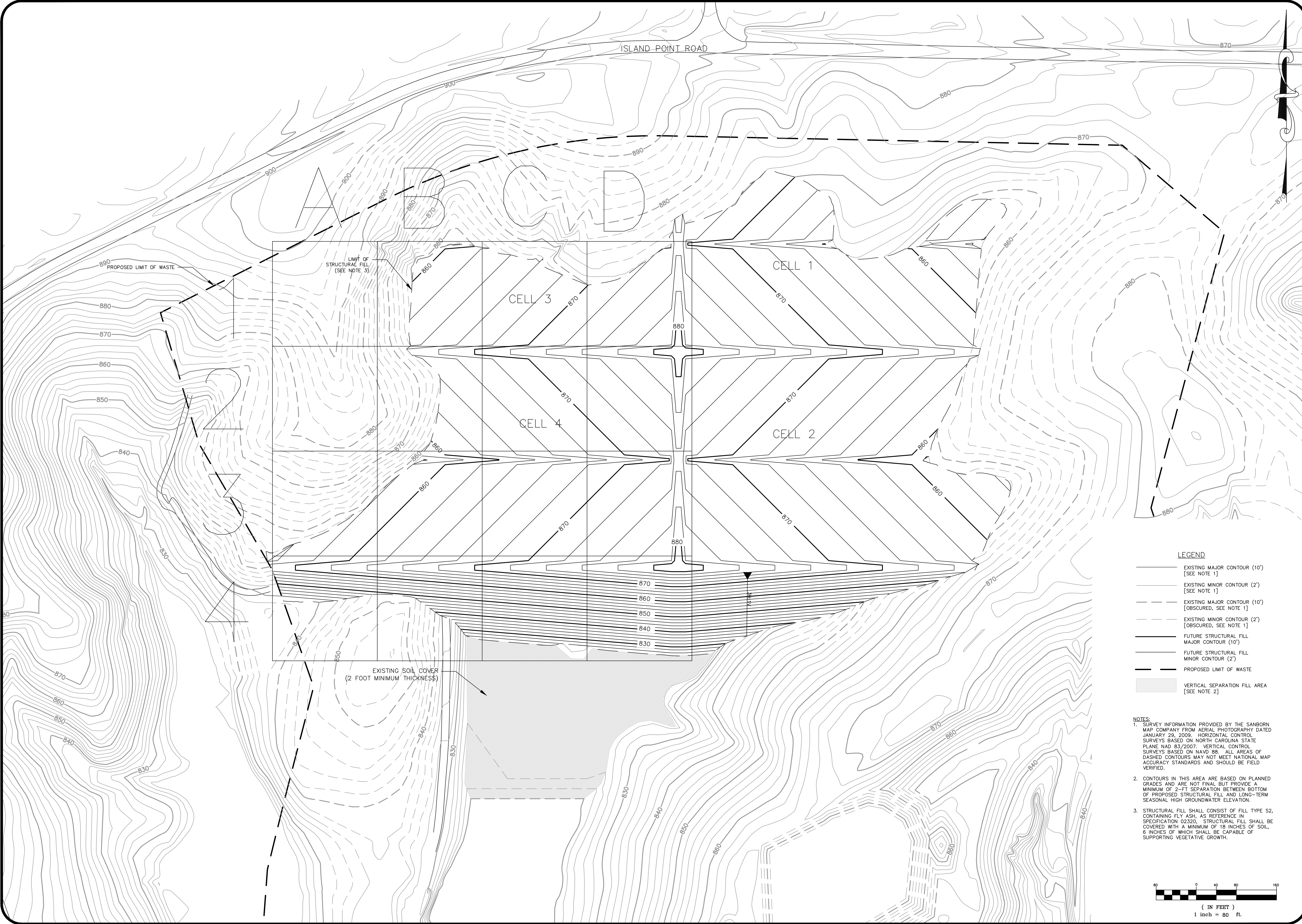
Kyle Baucom/S&ME, Inc.

Name (Technical Responsibility)


Signature

Project Engineer

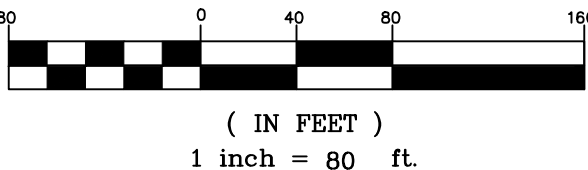
Position





LEGEND

- EXISTING MAJOR CONTOUR (10') [SEE NOTE 1]
- EXISTING MINOR CONTOUR (2') [SEE NOTE 1]
- EXISTING MAJOR CONTOUR (10') [OBSCURED, SEE NOTE 1]
- EXISTING MINOR CONTOUR (2') [OBSCURED, SEE NOTE 1]
- FUTURE STRUCTURAL FILL MAJOR CONTOUR (10')
- FUTURE STRUCTURAL FILL MINOR CONTOUR (2')
- PROPOSED LIMIT OF WASTE
- VERTICAL SEPARATION FILL AREA [SEE NOTE 2]

- NOTES:
- SURVEY INFORMATION PROVIDED BY THE SANBORN MAP COMPANY FROM AERIAL PHOTOGRAPHY DATED JANUARY 29, 2009. HORIZONTAL CONTROL SURVEYS BASED ON NORTH CAROLINA STATE PLANE NAD 83/2007. VERTICAL CONTROL SURVEYS BASED ON NAVD 88. ALL AREAS OF DASHED CONTOURS MAY NOT MEET NATIONAL MAP ACCURACY STANDARDS AND SHOULD BE FIELD VERIFIED.
 - CONTOURS IN THIS AREA ARE BASED ON PLANNED GRADES AND ARE NOT FINAL BUT PROVIDE A MINIMUM OF 2-FT SEPARATION BETWEEN BOTTOM OF PROPOSED STRUCTURAL FILL AND LONG-TERM SEASONAL HIGH GROUNDWATER ELEVATION.
 - STRUCTURAL FILL SHALL CONSIST OF FILL TYPE S2, CONTAINING FLY ASH, AS REFERENCE IN SPECIFICATION 02320. STRUCTURAL FILL SHALL BE COVERED WITH A MINIMUM OF 18 INCHES OF SOIL, 6 INCHES OF WHICH SHALL BE CAPABLE OF SUPPORTING VEGETATIVE GROWTH.





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ORIGINAL DRAWING SIGNED AND SEALED BY KENNETH R. DALY NC SEAL 032153 MAY 29, 2009	BY
	DESCRIPTION
	DATE
	NO.

PHASE 1 STRUCTURAL FILL
STRUCTURAL FILL NOTIFICATION

DUKE ENERGY MARSHALL STEAM STATION
TERRELL, NORTH CAROLINA

DRAWN BY: CLD	CHECKED BY: KRD
DESIGNED BY: WMH	APPROVED BY: KTD
PROJECT NUMBER 1356-08-122	DATE: 5-29-09
SCALE: 1" = 80'	OF: 3

DRAWING PATH: C:\DISK\DUKE ENERGY\1356\08\01\CELLS 3 AND 4\000\CELLS 3&4 FILL.DWG



ESP Associates, P.A.

3475 Lakemont Blvd

Fort Mill, SC 29708

Ph: (803) 802-2440

Fax: (803) 802-2515

www.espassociates.com

REPORT OF FIELD DENSITY TESTS

Project: Marshall Ash Landfill
Client: Charah, Inc.
ESP Project No: BP21.301
Report Date: August 14, 2013
Page: 1 of 1

TEST #	DATE	TYPE OF TEST	MAXIMUM DRY DENSITY (PCF)	OPTIMUM MOISTURE CONTENT (%)	IN-PLACE WET DENSITY (PCF)	IN-PLACE MOISTURE CONTENT (%)	IN-PLACE DRY DENSITY (PCF)	PERCENT COMPACTION (%)	LOCATION	APPROXIMATE ELEVATION (FT)	Test Specific Comment	Test # Linked to Comment(s):
1	4/26/13	NG	90.8	20.8	109.2	21.3	90.0	89	Cell #4, approximately center	existing ash elevation	Proctor S-2	
2	4/26/13	NG	90.8	20.8	105.3	20.1	87.6	98	Cell #3, approximately center	existing ash elevation	Proctor S-2	
3	4/26/13	DT	90.8	20.8	106.8	21.3	88.0	97	Cell #4, approximately center	existing ash elevation	Proctor S-2	
5	6/21/13	DT	80.0	27.0	95.1	24.0	76.7	96	Cell #3, approximately center	existing ash elevation	Proctor S-1	
6	6/21/13	DT	80.0	27.0	97.5	24.3	78.4	88	Cell #4, approximately center	existing ash elevation	Proctor S-1	

TYPE OF TEST

SC: SAND CONE
DT: DRIVE TUBE
NG: NUCLEAR GAUGE
RB: RUBBER BALLOON

REMARKS

Subgrade Fill Laboratory Test Results



Moisture - Density Report



Quality Assurance

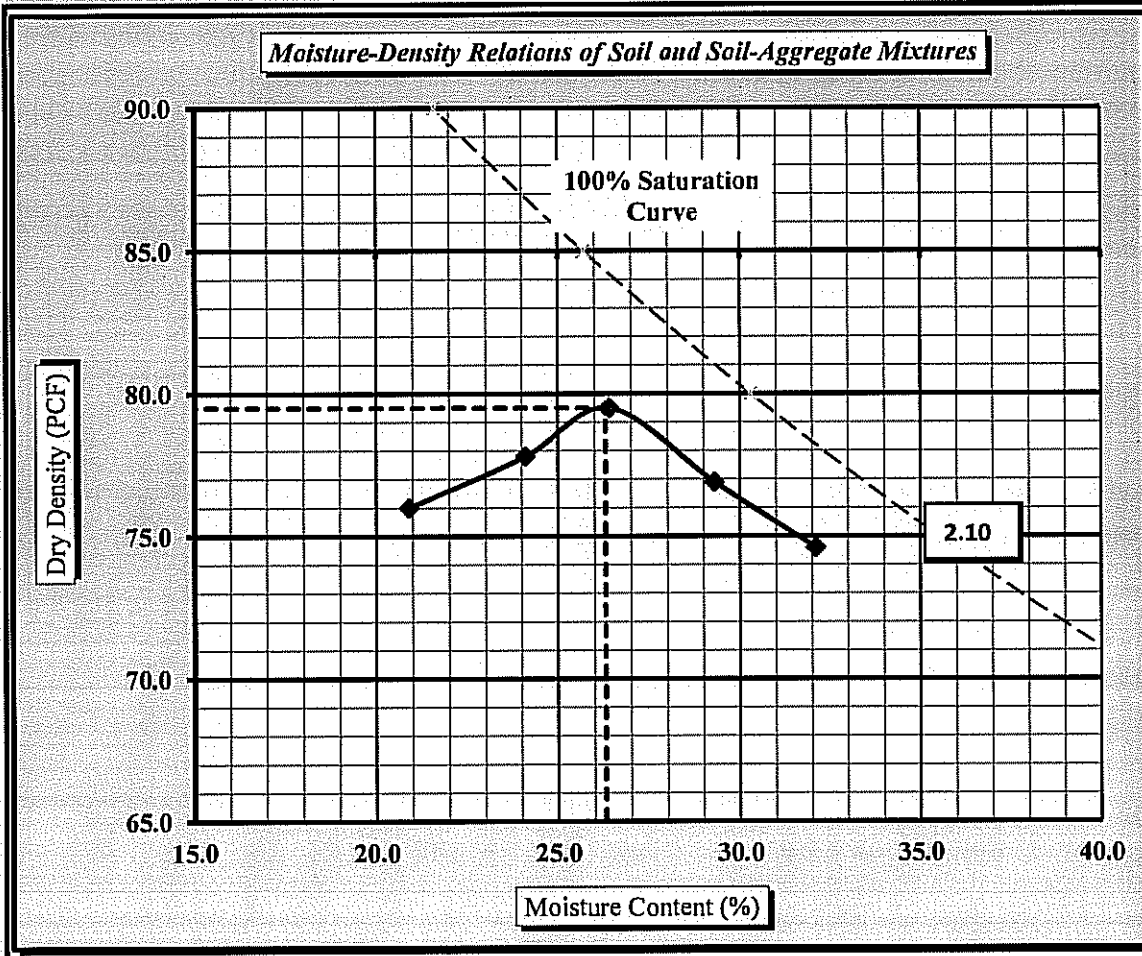
S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273

S&ME Project #:	1356-11-032	Phase 03	Report Date:	5/25/12	
Project Name:	Marshall Industrial Landfill No. 1 - Cells 3 & 4		Test Date(s):	5/23-25/12	
Client Name:	Duke Energy				
Client Address:	526 South Church Street, Charlotte, NC 28202				
Boring #:	NI	Sample #:	SG-1	Sample Date:	5/17/2012
Location:	Grid D3	Offset:	NI	Depth:	NI
Sample Description:	Black Fine Sandy Clayey Silt (ML) (Fly Ash)				

Maximum Dry Density 79.5 PCF.

Optimum Moisture Content 26.3%

ASTM D 698 -- Method A



Soil Properties

Natural Moisture Content	17.8%
Specific Gravity of Soil (D854)	ND
Liquid Limit	NP
Plastic Limit	NP
Plastic Index	NP

% Passing

3/4"	100.0%
3/8"	100.0%
#4	100.0%
#10	100.0%
#20	100.0%
#40	99.8%
#200	90.4%

Oversize Fraction

Bulk Gravity	
% Moisture	
% Oversize	
MDD	
Opt. MC	

Moisture-Density Curve Displayed: Fine Fraction ☒ Corrected for Oversize Fraction (ASTM D 4718) ☐

Sieve Size used to separate the Oversize Fraction: #4 Sieve ☒ 3/8 inch Sieve ☐ 3/4 inch Sieve ☐

Mechanical Rammer ☒ Manual Rammer ☐ Moist Preparation ☐ Dry Preparation ☒

References / Comments / Deviations: *ND = Not determined *NI = Information was not provided

ASTM D 2216: Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass

ASTM D 698: Laboratory Compaction Characteristics of Soil Using Standard Effort

Kyle Baucum
Technical Responsibility

[Signature]
Signature

[Signature]
Position

[Signature]
Date

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Moisture - Density Relationship



ASTM D558, D698, D1557, AASHTO T99, T180

Quality Assurance

S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273

Project #:	1356-11-032	Phase 03	Report Date:	5/25/12
Project Name:	Marshall Industrial Landfill No. 1 - Cells 3 & 4		Test Date(s)	5/23-25/12
Client Name:	Duke Energy			
Client Address:	526 South Church Street, Charlotte, NC 28202			
Boring #:	NI	Sample #:	SG-1	Sample Date:
Location:	Grid D3	Offset:	NI	Depth:
Sample Description:	Black Fine Sandy Clayey Silt (ML) (Fly Ash)			
Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #
Balance (0.1 g)	22182	6/8/2011	Compaction Mold	20231
Balance	22182	6/8/2011	Compaction Hammer	20222
Straightedge	20124	1/17/2012	Oven	11072
Sieve #4	10939	4/3/2012		

Water Content		Water Content requires GP 2 Balance (0.1 gram Readability).				Check:	
ASTM D2216 <input checked="" type="checkbox"/>		AASHTO T265 <input type="checkbox"/>		ASTM D4959 <input type="checkbox"/>		ASTM D4643 <input type="checkbox"/>	
Water Added:		150	200	100	50	250	
Tare #:		AMRL	JLG	GH	99	695	
A. Tare Weight	A.	163.5	162.8	164.1	157.9	161.1	
B. Wet Wt + Tare Wt	B.	1123.6	925.1	1187.8	1002.8	1241.9	
C. Dry Wt. + Tare Wt.	C.	923.0	752.3	989.1	857.8	978.2	
D. Water Weight	B-C	200.6	172.8	198.7	145.0	263.7	
E. Dry Weight	C-A	759.5	589.5	825.0	699.9	817.1	
F. Moisture Content	100*D/E	26.4%	29.3%	24.1%	20.7%	32.3%	
Compaction Data		Requires a GP 5 Balance for ASTM (1 gram or .0022 Lb. readability).				Check:	
ASTM D558 <input type="checkbox"/>		ASTM D 698 <input checked="" type="checkbox"/>		ASTM D1557 <input type="checkbox"/>		AASHTO T99 <input type="checkbox"/>	
Method A <input checked="" type="checkbox"/>		Method B <input type="checkbox"/>		Method C <input type="checkbox"/>		Method D (ASTM 1978) <input type="checkbox"/>	
AASHTO T180 <input type="checkbox"/>		AASHTO Method D <input type="checkbox"/>					
G. Wt of Soil + Mold	G.	5756	5739	5698	5628	5732	
H. Wt. of Mold	H.	4241	4241	4241	4241	4241	
I. Wt. of Soil (g. or lbs.)	G-H	1515	1498	1457	1387	1491	
J. Wt of Soil (Lbs.)	1/453.6 or 1	3.340	3.302	3.212	3.058	3.287	
K. Mold Volume Factor	K.	30.09	30.09	30.09	30.09	30.09	
L. Wet Density (PCF)	J*K	100.5	99.4	96.6	92.0	98.9	
M. Dry Density (PCF)	L/(1+F)	79.5	76.9	77.8	76.2	74.8	
Sieve Size used to separate the Oversize Fraction:		#4 Sieve <input checked="" type="checkbox"/>		3/8 inch Sieve <input type="checkbox"/>		3/4 inch Sieve <input type="checkbox"/>	
Mechanical Rammer <input checked="" type="checkbox"/>		Manual Rammer <input type="checkbox"/>		Moist Preparation <input type="checkbox"/>		Dry Preparation <input checked="" type="checkbox"/>	

References / Comments / Deviations: *ND = Not determined *NI = Information was not provided

Jennifer Olsen
Technician Name

Signature
NICET/117926
Certification Type/No.5/25/2012
DateKyle Baucom
Technical Responsibility

Signature

Position
6/1/12
Date

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Particle Size Analysis of Soils



ASTM D 422

S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273

Project #:		1356-11-132 Phase 03		Report Date:		6/1/12	
Project Name:		Marshall Industrial Landfill No. 1 - Cells 3&4		Test Date(s):		5/21/12-6/1/12	
Client Name:		Duke Energy		Address:		526 S. Church St., Charlotte, NC 28202	
Boring #:		NI		Sample #:		SG-1	
Location:		Grid D3		Offset:		NI	
Sample Description:		Black Fine Sandy Clayey Silt (ML) (Fly Ash)		Sample Date:		5/17/12	
Pan #:		8		Beaker #:		8	
Hydrometer Jar #:		1		Apparent Relative Density (Assumed)		2.100	
Pan Tare Weight (grams):		0.00		Moisture Content		Natural	
Total Sample Air Dried Wt. + tare wt. (grams):		262.98		Tare #		AL	
Weight of Total Sample Air Dried:		262.98		Tare Wt.		86.43	
Weight of Air Dried Hydrometer Sample (g):		50.00		Wet Wt. + A		301.48	
Total Sample Oven Dried:		261.61		Dry Wt. + A		268.92	
Hydrometer Sample Oven Dried (W):		49.74		Water Wt. (B-C)		32.56	
% Passing #10:		100.0%		Dry Wt. (C-A)		182.49	
Correction Factor a (Table 1):		1.11		% Moisture (100 x D/E)		0.52%	
Description of Sand & Gravel Particles		Rounded <input type="checkbox"/> Angular <input type="checkbox"/>		Hard & Durable <input type="checkbox"/> Soft <input type="checkbox"/>		Weathered & Friable <input type="checkbox"/>	
Stirring Apparatus: A <input checked="" type="checkbox"/> B <input type="checkbox"/>		Dispersion Time: 1 min.		Sodium Hexametaphosphate: 40 g./Liter			
Balance: ID No. 3222		Cal. Date: 6/22/2011		Hydrometer: ID No.		Cal. Date:	
Control Cylinder <input checked="" type="checkbox"/>		Composite Correction <input type="checkbox"/>		Type: 151H <input type="checkbox"/> 152H <input checked="" type="checkbox"/>			

Time	Temp. (0.5 °C)	Hydrometer Reading	Corrections		Hydrometer R	Percent Passing		Effective Depth L	Table 3 K	Diameter D = K x (L/T) ^{1/2}
			Control Cylinder	Composite		P (#10) = (R x a / W) x 100	P (total) = P x % Passing #10			
1	24.5	43.5	4.5		39.00	87.0%	87.0%	9.9	0.01584	0.04984
2	24.5	36.0	4.5		31.50	70.3%	70.3%	11.1	0.01584	0.03737
5	24.5	30.0	4.5		25.50	56.9%	56.9%	12.1	0.01584	0.02466
15	24.5	20.0	4.5		15.50	34.6%	34.6%	13.8	0.01584	0.01517
30	24.5	15.0	4.5		10.50	23.4%	23.4%	14.6	0.01584	0.01104
60	24.5	12.0	4.5		7.50	16.7%	16.7%	15.1	0.01584	0.00794
250	24.5	8.0	4.5		3.50	7.8%	7.8%	15.7	0.01584	0.00397
1440	24.5	6.0	4.5		1.50	3.3%	3.3%	16.0	0.01584	0.00167

References / Comments / Deviations ASTM D 422, D 2487, D 4318

NI = Information not provided. ND = Not determined.

Karen Warner

Technician Name

117900

Certification #

Kyle Baucom

Technical Responsibility

Project Engineer

Position

6/4/12

Date

S&ME, Inc. - Corporate

3201 Spring Forest Road
Raleigh, N.C. 27616

1356-11-032 Phase 03 SG-1 Hydro.xlsx

Page 1 of 1

Particle Size Analysis of Soils

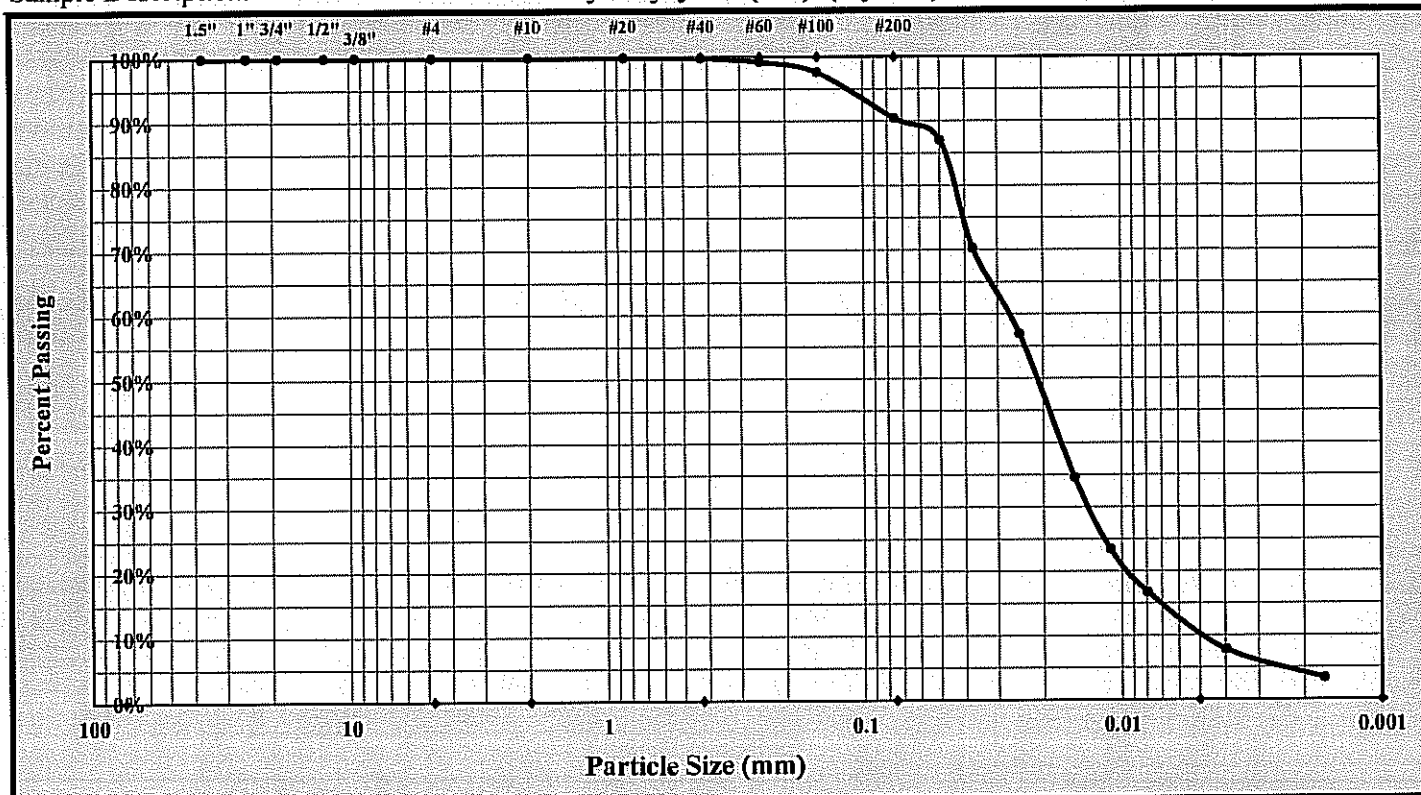


ASTM D422

Quality Assurance

S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273

S&ME Project #:	1356-11-132 Phase 03	Report Date:	6/1/12
Project Name:	Marshall Industrial Landfill No. 1 - Cells 3&4	Test Date(s):	5/21/12-6/1/12
Client Name:	Duke Energy		
Address:	526 S. Church St., Charlotte, NC 28202		
Boring #:	NI	Sample #:	SG-1
		Sample Date:	5/17/12
Location:	Grid D3	Offset:	NI
		Elevation:	NI
Sample Description:	Black Fine Sandy Clayey Silt (ML) (Fly Ash)		



Cobbles	< 300 mm (12") and > 75 mm (3")	Fine Sand	< 0.425 mm and > 0.075 mm (#200)
Gravel	< 75 mm and > 4.75 mm (#4)	Silt	< 0.075 and > 0.005 mm
Coarse Sand	< 4.75 mm and > 2.00 mm (#10)	Clay	< 0.005 mm
Medium Sand	< 2.00 mm and > 0.425 mm (#40)	Colloids	< 0.001 mm

Maximum Particle Size:	#10	Gravel:	0.0%	Silt	80.2%
Silt & Clay (% Passing #200):	90.4%	Total Sand:	9.6%	Clay	10.3%
Relative Density (Assumed)	2.100	Moisture Content	17.8%	Colloids	
Liquid Limit	NP	Plastic Limit	NP	Plastic Index	NP
Coarse Sand:	0.0%	Medium Sand:	0.1%	Fine Sand:	9.4%
Description of Sand and Gravel	Rounded <input type="checkbox"/> Angular <input type="checkbox"/> Hard & Durable <input type="checkbox"/> Soft <input type="checkbox"/> Weathered & Friable <input type="checkbox"/>				
Mechanical Stirring Apparatus A	Dispersion Period:	1 min.	Dispersing Agent:	Sodium Hexametaphosphate:	40 g./ Liter
References / Comments / Deviations:	ASTM D 4318, D 2487 NI = Information not provided. ND = Not determined.				
Technician Name:	Karen Warner		Date: 6/1/12		

Kyle Baucom
Technical Responsibility

[Signature]
Signature

[Signature]
Project Engineer
Position

[Signature]
Date

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Liquid Limit, Plastic Limit, and Plastic Index



S&ME, Inc. ~9751 Southern Pine Boulevard, Charlotte, NC 28273

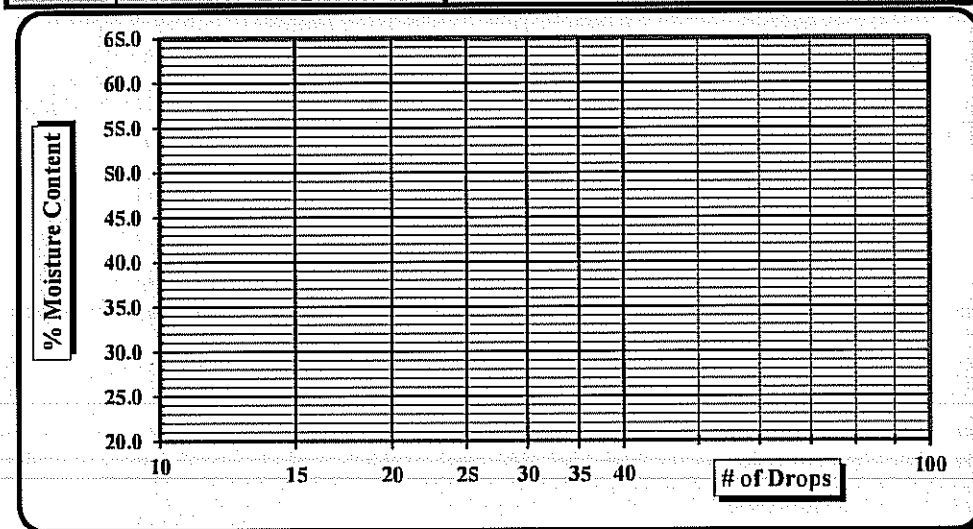
Project #: 1356-11-032 Phase 03 Report Date: 6/1/12
 Project Name: Marshall Industrial Landfill No. 1 - Cells 3 & 4 Test Date(s) 5/18/12-6/1/12
 Client Name: Duke Energy
 Client Address: 526 South Church Street, Charlotte, NC 28202

Boring #: NI Sample #: SG-1 Sample Date: 5/17/12
 Location: Grid D3 Offset: NI Elevation: NI

Sample Description: Black Fine Sandy Clayey Silt (ML) (Fly Ash)

Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #	Cal Date:
Balance (0.01 g)	3222	6/23/2011	Grooving tool	20165	12/20/2011
LL Apparatus	20230	6/23/2011	Grooving tool		
Oven	10844	5/9/2012	Grooving tool		

Pan #		Liquid Limit						Plastic Limit		
Tare #:										
A	Tare Weight									
B	Wet Soil Weight + A									
C	Dry Soil Weight + A									
D	Water Weight (B-C)									
E	Dry Soil Weight (C-A)									
F	% Moisture (D/E)*100									
N	# OF DROPS							Moisture Contents determined by ASTM D 2216		
LL	LL = F * FACTOR									
Ave.	Average									



One Point Liquid Limit			
N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic ☒

Liquid Limit

Plastic Limit

Plastic Index

Group Symbol ML

Multipoint Method ☒One-point Method ☐

Wet Preparation ☐ Dry Preparation ☒ Air Dried ☒ Estimate the % Retained on the #40 Sieve:
 Notes / Deviations / References: NI = Information not provided.

ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils

Jennifer Olsen

Technician Name

Jennifer Olsen 6/1/2012
 Date

Kyle Baucom

Technical Responsibility

6/1/12
 Date

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Particle Size Analysis of Soils

ASTM D 422



S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273

Project #:		1356-11-032 Phase 03		Report Date:		6/27/12	
Project Name:		Mashall Industrial Landfill No.1 - Cells 3&4					
Client Name:		Duke Energy					
Boring #:		NA		Sample #:		SG-2	
Location:		Grid C3		Offset:		NA	
Sample Description:		Black Gray Silt (ML)					
Pan #:	Beaker #:	Apparent Relative Density (Assumed)		2.200		Sample Date:	
Hydrometer Jar #:		Moisture Content		Hygroscopic		Natural	
Pan Tare Weight (grams):		Tare #		XX		Jazz	
Total Sample Air Dried Wt. + tare wt. (grams):		309.25		Tare Wt.		81.37	
Weight of Total Sample Air Dried:		309.25		Wet Wt. + A		370.08	
Weight of Air Dried Hydrometer Sample (g):		50.00		Dry Wt. + A		326.44	
Total Sample Oven Dried:		308.72		Water Wt. (B-C)		43.64	
Hydrometer Sample Oven Dried (W):		49.91		Dry Wt. (C-A)		245.07	
% Passing #10:		100.0%		% Moisture (100 x D/E)		17.8%	
Correction Factor a (Table 1):		1.09		Soft		Weathered & Friable	
Description of Sand & Gravel Particles		Rounded		Angular		Dispersible	
Stirring Apparatus:		A		B		Dispersion Time: 1 min.	
Balance:		ID No. 3222		Cal. Date: 6/25/2012		Hydrometer: ID No. 3901	
Control Cylinder		Composite Correction		Type: 151H		152H	

Time	Temp. (0.5 °C)	Hydrometer Reading	Corrections		Hydrometer R	Percent Passing		Effective Depth L	Table 3 K	Diameter D = K x (L/T) ^{1/2}
			Control Cylinder	Composite		P(-#10) = (R x a / W) x 100	P (total) = P x % Passing #10			
1	21.5	45.0	5.0		40.00	87.3%	87.3%	9.7	0.01571	0.04903
2	21.5	39.0	5.0		34.00	74.2%	74.2%	10.7	0.01571	0.03638
5	21.5	29.0	5.0		24.00	52.4%	52.4%	12.4	0.01571	0.02470
15	21.5	16.5	5.0		11.50	25.1%	25.1%	14.4	0.01571	0.01540
30	21.5	13.0	5.0		8.00	17.5%	17.5%	15.0	0.01571	0.01110
60	21.5	10.0	5.0		5.00	10.9%	10.9%	15.5	0.01571	0.00798
250	21.0	8.0	5.0		3.00	6.6%	6.5%	15.8	0.01581	0.00397
1440	23.0	5.5	4.5		1.00	2.2%	2.2%	16.1	0.01544	0.00163

References / Comments / Deviations: ASTM D 422, D 2487, D 4318

Karen Warner

Technician Name

NICET 117900

Certification #

Kyle Baucom

Technical Responsibility

Project Engineer

Position

7/2/12

Date

Particle Size Analysis of Soils

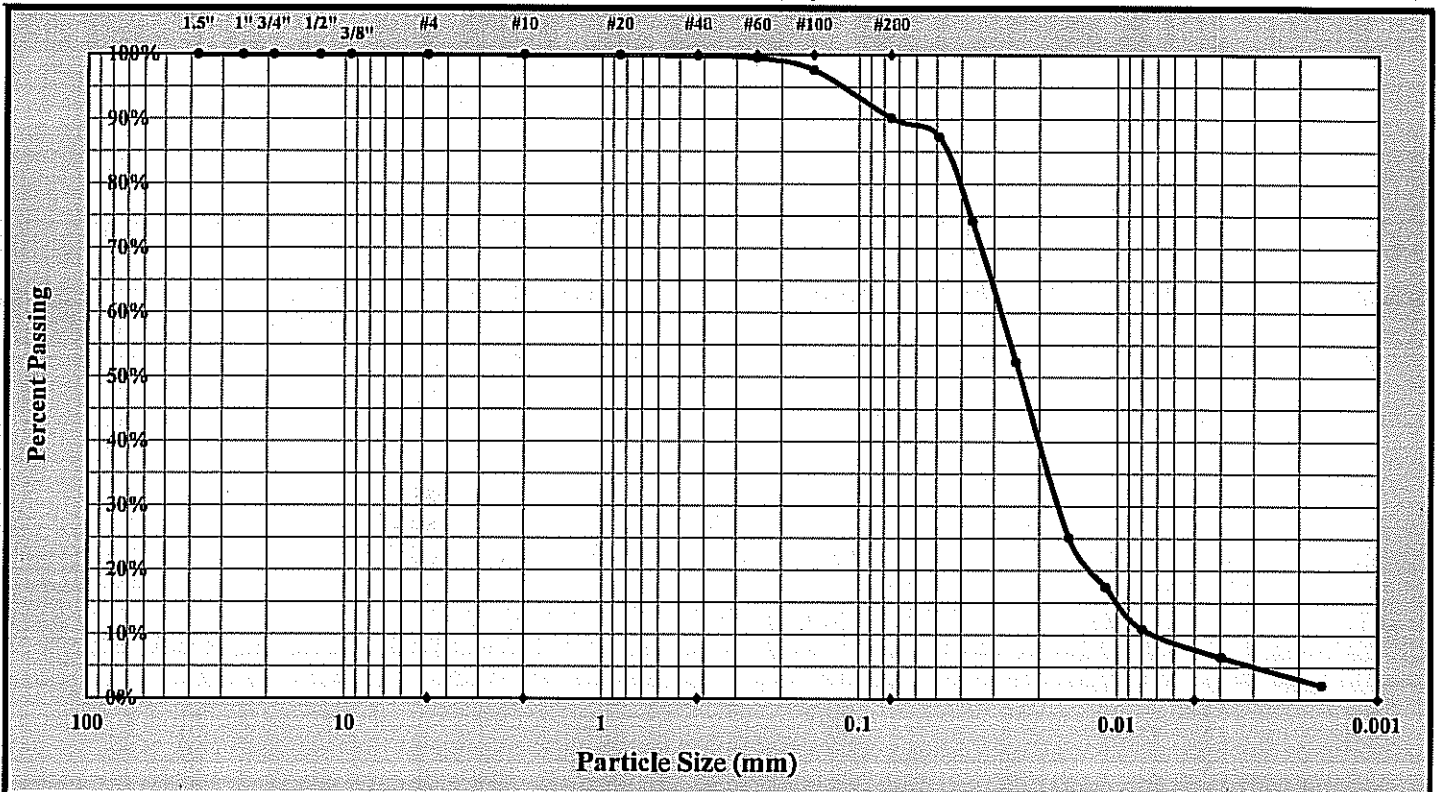


ASTM D422

Quality Assurance

S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273

S&ME Project #:	1356-11-032 Phase 03	Report Date:	6/27/12
Project Name:	Mashall Industrial Landfill No.1 - Cells 3&4	Test Date(s):	6/20-27/12
Client Name:	Duke Energy		
Address:	526 S. Church Street, Charlotte, NC 28202		
Boring #:	NA	Sample #:	SG-2
		Sample Date:	6/4/12
Location:	Grid C3	Offset:	NA
		Elevation:	NA
Sample Description:	Black Gray Silt (ML)	Fly Ash	



Cobbles	< 300 mm (12") and > 75 mm (3")	Fine Sand	< 0.425 mm and > 0.075 mm (#200)
Gravel	< 75 mm and > 4.75 mm (#4)	Silt	< 0.075 and > 0.005 mm
Coarse Sand	< 4.75 mm and > 2.00 mm (#10)	Clay	< 0.005 mm
Medium Sand	< 2.00 mm and > 0.425 mm (#40)	Colloids	< 0.001 mm

Maximum Particle Size:	#10	Gravel:	0.0%	Silt	82.2%
Silt & Clay (% Passing #200):	90.2%	Total Sand:	9.8%	Clay	8.0%
Relative Density (Assumed)	2.200	Moisture Content	17.8%	Colloids	
Liquid Limit	36	Plastic Limit	36	Plastic Index	0
Coarse Sand:	0.0%	Medium Sand:	0.1%	Fine Sand:	9.6%

Description of Sand and Gravel	Rounded <input type="checkbox"/>	Angular <input checked="" type="checkbox"/>	Hard & Durable <input checked="" type="checkbox"/>	Soft <input type="checkbox"/>	Weathered & Friable <input type="checkbox"/>
Mechanical Stirring Appantus A	Dispersion Period:	1 min.	Dispersing Agent:	Sodium Hexametaphosphate:	40 g/Liter

References / Comments / Deviations: ASTM D 4318, D 854, D 2487

Technician Name: Kyle Baucom Date: 6/28/12

Kyle Baucom
Technical Responsibility

Kyle Baucom
Signature

Project Engineer
Position

7/2/12
Date

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Moisture - Density Relationship



ASTM D558, D698, D1557, AASHTO T99, T180

Quality Assurance

S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273

Project #:	1356-11-032	Phase 03	Report Date:	6/25/12
Project Name:	Marshall Industrial Landfill No. 1 - Cells 3 & 4		Test Date(s)	6/21-25/12
Client Name:	Duke Energy			
Client Address:	526 South Church Street, Charlotte, NC 28202			
Boring #:	NA	Sample #:	SG-2	Sample Date:
Location:	Grid C3	Offset:	NI	Depth:
Sample Description:	Black Gray Silt (ML)		Fly Ash	

Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #	Cal Date:
Balance (0.1 g)	22182	6/8/2012	Compaction Mold	20231	1/6/2012
Balance	22182	6/8/2012	Compaction Hammer	20222	6/6/2012
Straightedge	20179	1/28/2012	Oven	11072	3/23/2012
Sieve	22100	4/3/2012			

Water Content		Water Content requires GP 2 Balance (0.1 gram Readability).				Check:	
ASTM D2216 <input checked="" type="checkbox"/>		AASHTO T265 <input type="checkbox"/>		ASTM D4959 <input type="checkbox"/>		ASTM D4643 <input type="checkbox"/>	
Water Added:		600	650	550	500	450	
Tare #:		18	AMRL 148	SR	JDM	MAC	
A. Tare Weight	A.	157.4	160.6	163.6	159.2	161.6	
B. Wet Wt + Tare Wt	B.	976.3	1060.4	1056.4	985.5	904.7	
C. Dry Wt. + Tare Wt.	C.	788.0	840.1	863.7	818.0	765.9	
D. Water Weight	B-C	188.3	220.3	192.7	167.5	138.8	
E. Dry Weight	C-A	630.6	679.5	700.1	658.8	604.3	
F. Moisture Content	100*D/E	29.9%	32.4%	27.5%	25.4%	23.0%	

Compaction Data		Requires a GP 5 Balance for ASTM (1 gram or .0022 Lb. readability).				Check:	
ASTM D558 <input type="checkbox"/>		ASTM D 698 <input checked="" type="checkbox"/>		ASTM D1557 <input type="checkbox"/>		AASHTO T99 <input type="checkbox"/>	
Method A <input checked="" type="checkbox"/>		Method B <input type="checkbox"/>		Method C <input type="checkbox"/>		Method D (ASTM 1978) <input type="checkbox"/>	
						AASHTO T180 <input type="checkbox"/>	
						AASHTO Method D <input type="checkbox"/>	
G. Wt of Soil + Mold	G.	5731	5705	5723	5673	5615	
H. Wt. of Mold	H.	4242	4242	4242	4242	4242	
I. Wt. of Soil (g. or lbs.)	G-H	1489	1463	1481	1431	1373	
J. Wt of Soil (Lbs.)	1/453.6 or I	3.283	3.225	3.265	3.155	3.027	
K. Mold Volume Factor	K.	30.09	30.09	30.09	30.09	30.09	
L. Wet Density (PCF)	J*K	98.8	97.0	98.2	94.9	91.1	
M. Dry Density (PCF)	L/(1+F)	76.1	73.3	77.0	75.7	74.1	
Sieve Size used to separate the Oversize Fraction:		#4 Sieve <input checked="" type="checkbox"/>		3/8 inch Sieve <input type="checkbox"/>		3/4 inch Sieve <input type="checkbox"/>	
Mechanical Rammer <input checked="" type="checkbox"/>		Manual Rammer <input type="checkbox"/>		Moist Preparation <input type="checkbox"/>		Dry Preparation <input checked="" type="checkbox"/>	

References / Comments / Deviations: NI = Information not provided, ND = Not determined.

Jennifer Olsen
Technician Name

Jennifer Olsen
Signature

NICET / 117926
Certification Type/No.

6/25/2012
Date

Kyle Baucom
Technical Responsibility

Kyle Baucom
Signature

Project Engineer
Position

7/2/12
Date

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Moisture - Density Report



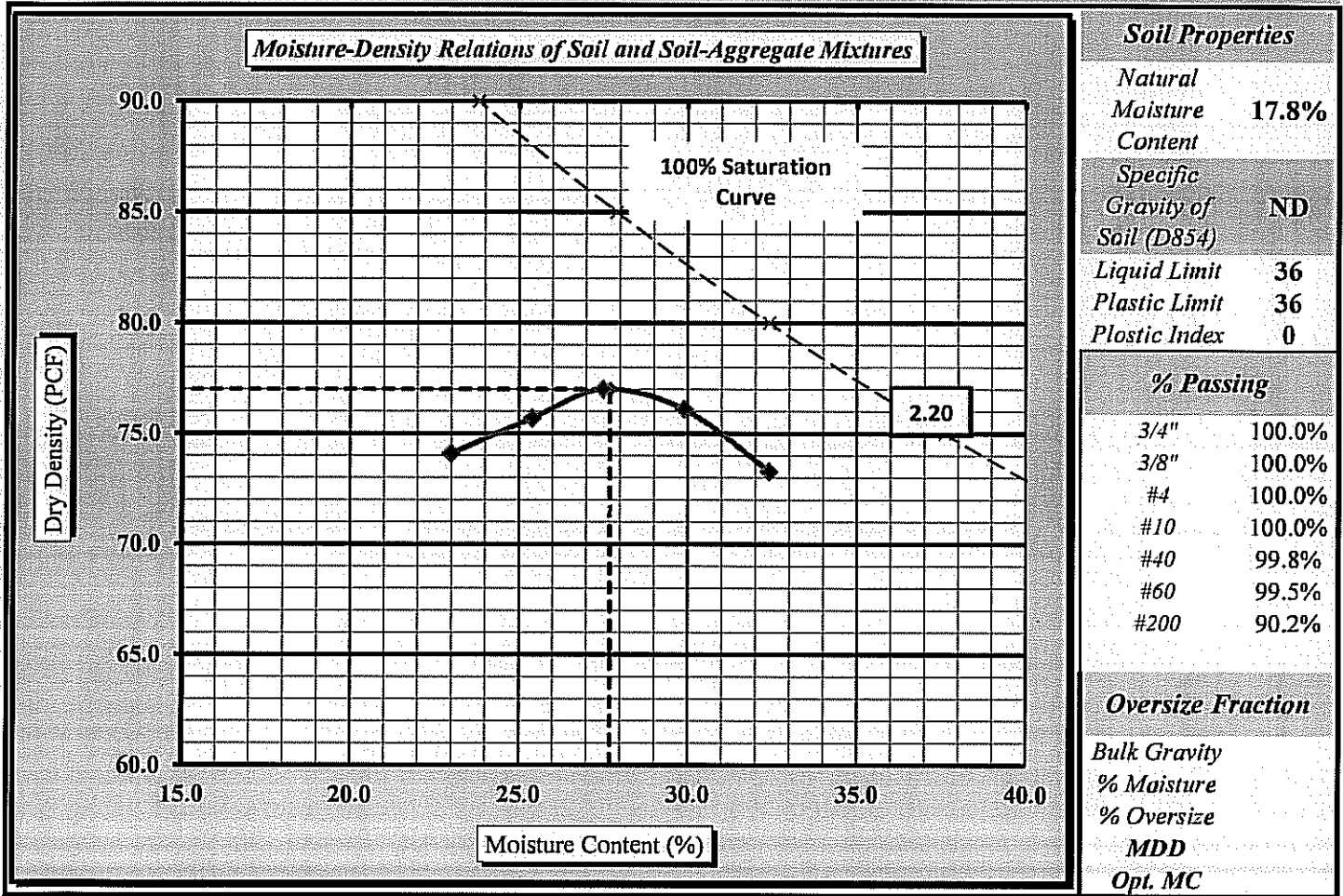
Quality Assurance

S&ME, Inc.~ 9751 Southern Pine Boulevard~Charlotte, NC 28273

S&ME Project #:	1356-11-032	Phase 03	Report Date:	6/25/12	
Project Name:	Marshall Industrial Landfill No. 1 - Cells 3 & 4		Test Date(s):	6/21-25/12	
Client Name:	Duke Energy				
Client Address:	526 South Church Street, Charlotte, NC 28202				
Boring #:	NA	Sample #:	SG-2	Sample Date:	6/4/2012
Location:	Grid C3	Offset:	NI	Depth:	NA
Sample Description:	Black Gray Silt (ML)		Fly Ash		

Maximum Dry Density 77.0 PCF. Optimum Moisture Content 27.7%

ASTM D 698 -- Method A



Moisture-Density Curve Displayed: Fine Fraction ☒ Corrected for Oversize Fraction (ASTM D 4718) ☐
 Sieve Size used to separate the Oversize Fraction: #4 Sieve ☒ 3/8 inch Sieve ☐ 3/4 inch Sieve ☐
 Mechanical Rammer ☒ Manual Rammer ☐ Moist Preparation ☐ Dry Preparation ☒

References / Comments / Deviations: NI = Information not provided. ND = Not determined.

Technician Name: Jennifer Olsen *Jennifer Olsen* Date: 6/25/12

Kyle Baucom
Technical Responsibility

Kyle Baucom
Signature

Project Engineer
Position

7/2/12
Date

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Liquid Limit, Plastic Limit, and Plastic Index



Another code

ASTM D 4318 ☒AASHTO T 89 ☐AASHTO T 90 ☐

Quality Assurance

S&ME, Inc. ~9751 Southern Pine Boulevard, Charlotte, NC 28273

Project #: 1356-11-032 Phase 03

Report Date: 6/28/12

Project Name: Marshall Industrial Landfill No.1 - Cells 3&4

Test Date(s) 6/20-28/12

Client Name: Duke Energy

Client Address: 526 South Church Street, Charlotte, NC 28202

Boring #: NA

Sample #: SG-2

Sample Date: 6/4/12

Location: Grid C3

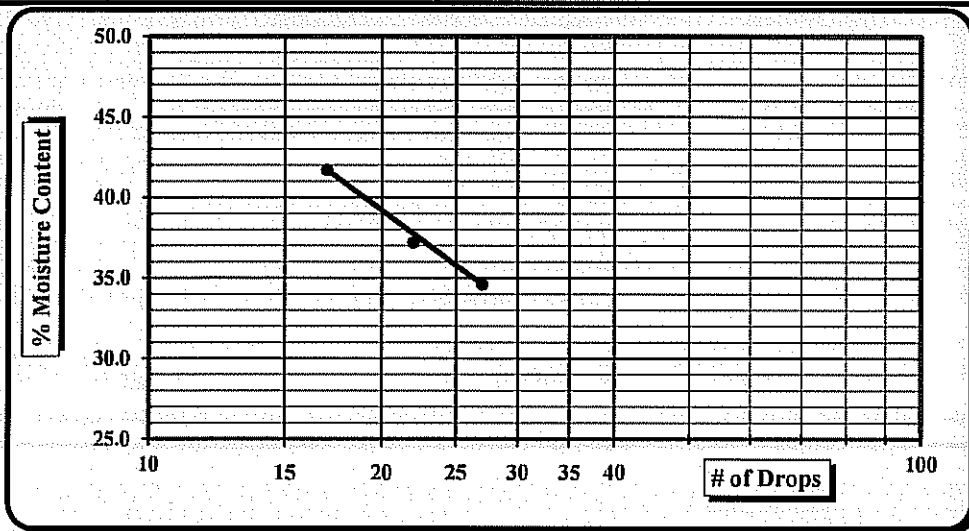
Offset:

Elevation: NA

Sample Description: Black Gray Silt (ML) Fly Ash

Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #	Cal Date:
Balance (0.01 g)	3222	6/25/2012	Grooving tool	20165	12/20/2012
LL Apparatus	20230	6/26/2012	Grooving tool		
Oven	10844	5/9/2012	Grooving tool		

Pan #	Tare #:	Liquid Limit					Plastic Limit		
		II	RR	34			P-6	P-1	
A	Tare Weight	16.90	15.28	14.98			12.55	12.58	
B	Wet Soil Weight + A	27.95	26.98	23.41			18.86	19.45	
C	Dry Soil Weight + A	25.11	23.81	20.93			17.19	17.63	
D	Water Weight (B-C)	2.84	3.17	2.48			1.67	1.82	
E	Dry Soil Weight (C-A)	8.21	8.53	5.95			4.64	5.05	
F	% Moisture (D/E)*100	34.6%	37.2%	41.7%			36.0%	36.0%	
N	# OF DROPS	27	22	17			Moisture Contents determined by ASTM D 2216		
LL	LL = F * FACTOR								
Ave.	Average						36.0%		



One Point Liquid Limit			
N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic ☐

Liquid Limit 36

Plastic Limit 36

Plastic Index

Group Symbol ML

Multipoint Method ☒One-point Method ☐Wet Preparation ☐ Dry Preparation ☒ Air Dried ☒

Estimate the % Retained on the #40 Sieve:

Notes / Deviations / References:

ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils

Karen Warner
Technician Name6/28/2012
DateKyle Baucom
Technical Responsibility7/2/12
Date

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Quality Assurance

Project #:	1356-11-032	Phase 03	Report Date:	8/7/12
Project Name:	Marshall Industrial Landfill No. 1 - Cells 3 & 4		Test Date(s):	8/3-7/12
Client Name:	Duke Energy			
Client Address:	526 South Church Street, Charlotte, NC 28202			
Sample by:	Jimmy Addis		Sample Date(s):	7/25/12
Sampling Method:	NI		Drill Rig :	NI

Method: A (1%) ☐ B (0.1%) ☒ Balance ID: 3222 Calibration Date: 6/25/12

[illegible]

Was no baggie or jar, so moisture sample was taken from the bottom of the bucket.

ASTM D 2216: Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass

2/5/12
Date

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Particle Size Analysis of Soils



ASTM D 422

S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273

Project #: 1356-11-032 Phase 03

Report Date: 8/10/12

Project Name: Marshall Industrial Landfill No. 1 Cells - 3&4

Test Date(s): 7/28-8/10/12

Client Name: Duke Energy

Address: 526 South Church Street, Charlotte, NC 28202

Boring #: NA

Sample #:

SG-3

Sample Date: 7/5/12 & 7/12/12

Sieve

3.0"

Retained Wt.

0.0

0.0

0.0

Location: NA

Sample #:

SG-3

Sample Date: 7/5/12 & 7/12/12

Sieve

3.0"

Retained Wt.

0.0

0.0

0.0

Sample Description: Black Gray Silt (ML)

Sample #:

SG-3

Sample Date: 7/5/12 & 7/12/12

Sieve

3.0"

Retained Wt.

0.0

0.0

0.0

Pan #:

Sample #:

SG-3

Sample Date: 7/5/12 & 7/12/12

Sieve

3.0"

Retained Wt.

0.0

0.0

0.0

Hydrometer Jar #:

Sample #:

SG-3

Sample Date: 7/5/12 & 7/12/12

Sieve

3.0"

Retained Wt.

0.0

0.0

0.0

Pan Tare Weight (grams):

Sample #:

SG-3

Sample Date: 7/5/12 & 7/12/12

Sieve

3.0"

Retained Wt.

0.0

0.0

0.0

Total Sample Air Dried Wt. + tare wt. (grams):

Sample #:

SG-3

Sample Date: 7/5/12 & 7/12/12

Sieve

3.0"

Retained Wt.

0.0

0.0

0.0

Weight of Total Sample Air Dried:

Sample #:

SG-3

Sample Date: 7/5/12 & 7/12/12

Sieve

3.0"

Retained Wt.

0.0

0.0

0.0

Weight of Air Dried Hydrometer Sample (g):

Sample #:

SG-3

Sample Date: 7/5/12 & 7/12/12

Sieve

3.0"

Retained Wt.

0.0

0.0

0.0

Total Sample Oven Dried:

Sample #:

SG-3

Sample Date: 7/5/12 & 7/12/12

Sieve

3.0"

Retained Wt.

0.0

0.0

0.0

Hydrometer Sample Oven Dried (W):

Sample #:

SG-3

Sample Date: 7/5/12 & 7/12/12

Sieve

3.0"

Retained Wt.

0.0

0.0

0.0

% Passing #10:

Sample #:

SG-3

Sample Date: 7/5/12 & 7/12/12

Sieve

3.0"

Retained Wt.

0.0

0.0

0.0

Correction Factor a (Table 1):

Sample #:

SG-3

Sample Date: 7/5/12 & 7/12/12

Sieve

3.0"

Retained Wt.

0.0

0.0

0.0

Description of Sand & Gravel Particles

Sample #:

SG-3

Sample Date: 7/5/12 & 7/12/12

Sieve

3.0"

Retained Wt.

0.0

0.0

0.0

Stirring Apparatus: A

Sample #:

SG-3

Sample Date: 7/5/12 & 7/12/12

Sieve

3.0"

Retained Wt.

0.0

0.0

0.0

Balance: ID No. 3222

Sample #:

SG-3

Sample Date: 7/5/12 & 7/12/12

Sieve

3.0"

Retained Wt.

0.0

0.0

0.0

Control Cylinder

Sample #:

SG-3

Sample Date: 7/5/12 & 7/12/12

Sieve

3.0"

Retained Wt.

0.0

0.0

0.0

Time

Sample #:

SG-3

Sample Date: 7/5/12 & 7/12/12

Sieve

3.0"

Retained Wt.

0.0

0.0

0.0

T (Min.)

Sample #:

SG-3

Sample Date: 7/5/12 & 7/12/12

Sieve

3.0"

Retained Wt.

0.0

0.0

0.0

1

Sample #:

SG-3

Sample Date: 7/5/12 & 7/12/12

Sieve

3.0"

Retained Wt.

0.0

0.0

0.0

2

Sample #:

SG-3

Sample Date: 7/5/12 & 7/12/12

Sieve

3.0"

Retained Wt.

0.0

0.0

0.0

5

Sample #:

SG-3

Sample Date: 7/5/12 & 7/12/12

Sieve

3.0"

Retained Wt.

0.0

0.0

0.0

15

Sample #:

SG-3

Sample Date: 7/5/12 & 7/12/12

Sieve

3.0"

Retained Wt.

0.0

0.0

0.0

30

Sample #:

SG-3

Sample Date: 7/5/12 & 7/12/12

Sieve

3.0"

Retained Wt.

0.0

0.0

0.0

60

Sample #:

SG-3

Sample Date: 7/5/12 & 7/12/12

Sieve

3.0"

Retained Wt.

0.0

0.0

0.0

250

Sample #:

SG-3

Sample Date: 7/5/12 & 7/12/12

Sieve

3.0"

Retained Wt.

0.0

0.0

0.0

1440

Sample #:

SG-3

Sample Date: 7/5/12 & 7/12/12

Sieve

3.0"

Retained Wt.

0.0

0.0

0.0

Oven Temperature Set at 60C.

Sample #:

SG-3

Sample Date: 7/5/12 & 7/12/12

Sieve

3.0"

Retained Wt.

0.0

0.0

0.0

References / Comments / Deviations

Sample #:

SG-3

Sample Date: 7/5/12 & 7/12/12

Sieve

3.0"

Retained Wt.

0.0

0.0

0.0

Oven Temperature Set at 60C.

Sample #:

SG-3

Sample Date: 7/5/12 & 7/12/12

Sieve

3.0"

Retained Wt.

0.0

0.0

0.0

Jennifer Olsen/Karen Warner

NICET 117900

Kyle Baucom

Project Engineer

8/15/12

Technical Name

Certification #

Technical Responsibility

Position

Date

S&ME, Inc. - Corporate

3201 Spring Forest Road
Raleigh, N.C. 276161356-11-032 Phase 03 SG-3 Hydro.xls
Page 1 of 1

Particle Size Analysis of Soils



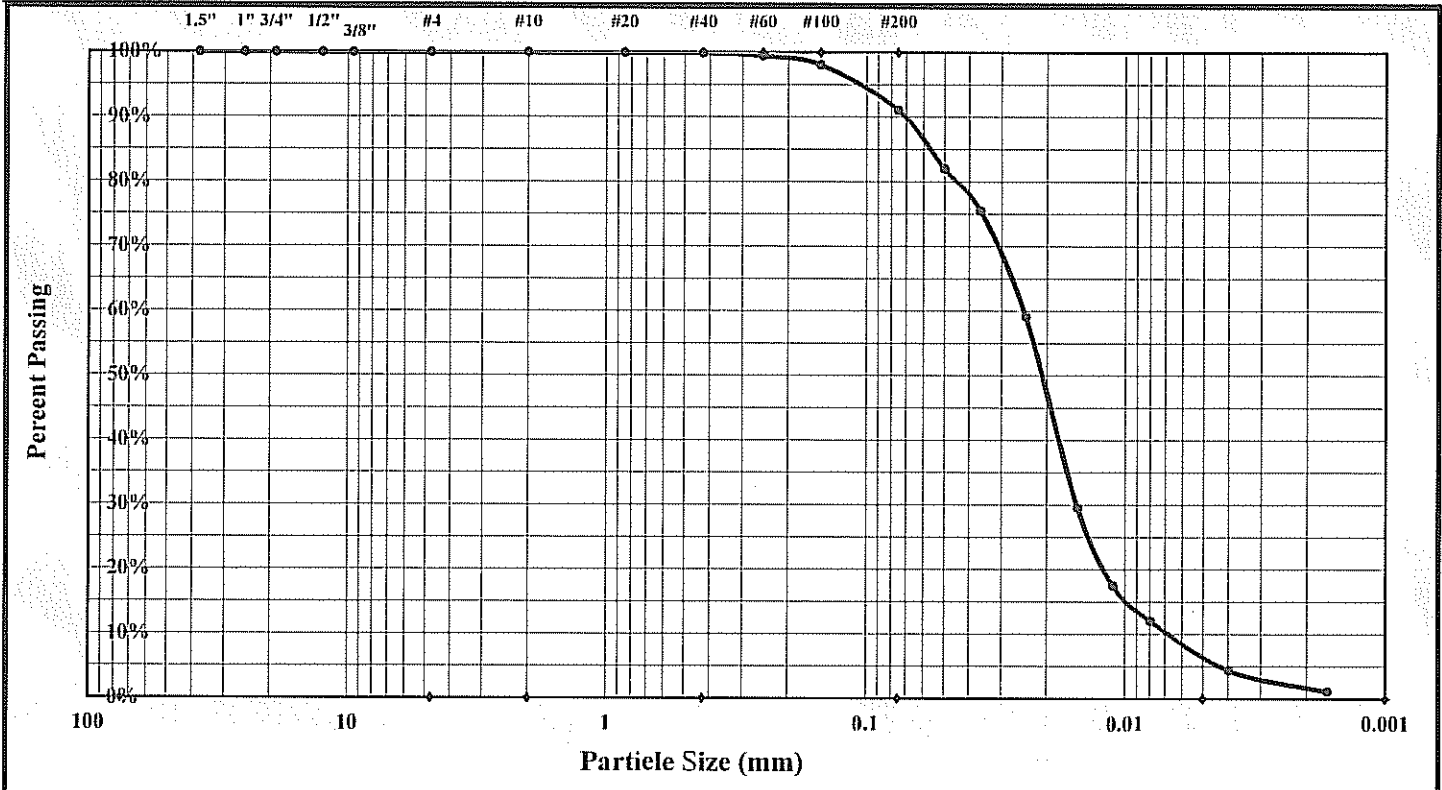
ASTM D422

Quality Assurance

S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273

S&ME Project #:	1356-11-032 Phase 03	Report Date:	8/10/12
Project Name:	Marshall Industrial Landfill No. 1 Cells - 3&4	Test Date(s):	7/28-8/10/12
Client Name:	Duke Energy		
Address:	526 South Church Street, Charlotte, NC 28202		
Boring #:	NA	Sample #:	SG-3
		Sample Date:	7/5/12 & 7/12/12
Location:	Grid C3	Offset:	NA
		Elevation:	NA

Sample Description: Black Gray Silt (ML)



Cobbles	< 300 mm (12") and > 75 mm (3")	Fine Sand	< 0.425 mm and > 0.075 mm (#200)
Gravel	< 75 mm and > 4.75 mm (#4)	Silt	< 0.075 and > 0.005 mm
Coarse Sand	< 4.75 mm and > 2.00 mm (#10)	Clay	< 0.005 mm
Medium Sand	< 2.00 mm and > 0.425 mm (#40)	Colloids	< 0.001 mm

Maximum Particle Size:	#10	Gravel:	0.0%	Silt	85.0%
Silt & Clay (% Passing #200):	91.0%	Total Sand:	9.0%	Clay	6.0%
Unit Relative Density (Assumed)	2.200	Moisture Content	14.8%	Colloids	
Liquid Limit	NP	Plastic Limit	NP	Plastic Index	NP
Coarse Sand:	0.0%	Medium Sand:	0.1%	Fine Sand:	8.9%

Description of Sand and Gravel	Rounded <input type="checkbox"/>	Angular <input checked="" type="checkbox"/>	Hard & Durable <input checked="" type="checkbox"/>	Soft <input type="checkbox"/>	Weathered & Friable <input type="checkbox"/>
Mechanical Stirring Apparatus A	Dispersion Period:	1 min.	Dispersing Agent:	Sodium Hexametaphosphate:	40 g./ Liter

References / Comments / Deviations: ASTM D 4318, D 854, D 2487

Technician Name: Kyle Baucom Date: 8/10/12

Kyle Baucom
Technical Responsibility

[Signature]
Signature

Project Engineer
Position

8/15/12
Date

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Liquid Limit, Plastic Limit, and Plastic Index



Another code

ASTM D 4318 ☒AASHTO T 89 ☐AASHTO T 90 ☐

Quality Assurance

S&ME, Inc. ~9751 Southern Pine Boulevard, Charlotte, NC 28273

Project #: 1356-11-032 Phase 03

Report Date: 8/10/12

Project Name: Marshall Industrial Landfill No.1- Cells 3&4

Test Date(s) 7/28-8/10/12

Client Name: Duke Energy

Client Address: 526 South Church Street, Charlotte, NC 28202

Boring #: NA

Sample #: SG-3

Sample Date: 7/5/12 & 7/12/12

Location: Grid C3

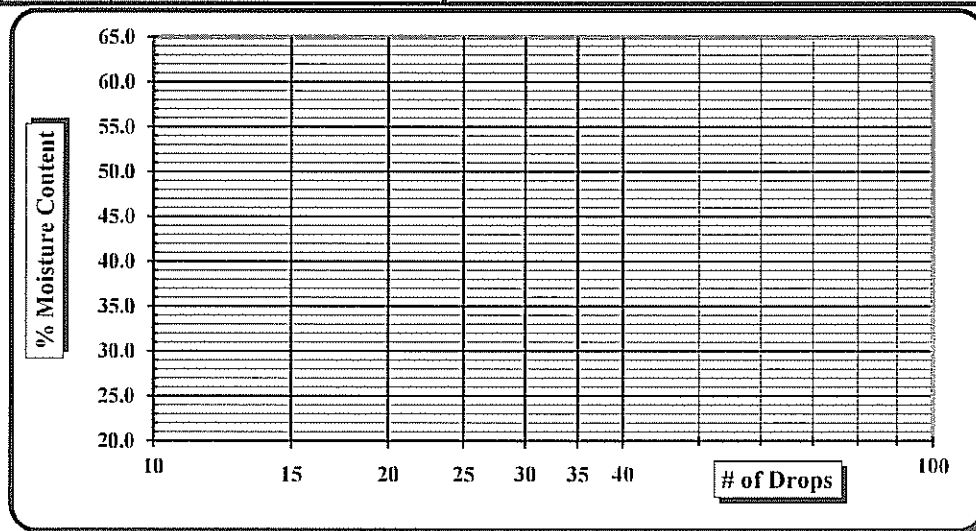
Offset: NA

Elevation: NA

Sample Description: Black Gray Silt (ML)

Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #	Cal Date:
Balance (0.01 g)	3222	6/25/2012	Grooving tool	20165	12/20/2012
LL Apparatus	20230	6/26/2012	Grooving tool		
Oven	10844	5/9/2012	Grooving tool		

Part #	Tare #:	Liquid Limit					Plastic Limit		
A	Tare Weight								
B	Wet Soil Weight + A								
C	Dry Soil Weight + A								
D	Water Weight (B-C)								
E	Dry Soil Weight (C-A)								
F	% Moisture (D/E)*100								
N	# OF DROPS						Moisture Contents determined by ASTM D 2216		
LL	LL = F * FACTOR								
Ave.	Average								



One Point Liquid Limit			
N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic ☒

Liquid Limit

Plastic Limit

Plastic Index

Group Symbol ML

Multipoint Method ☒One-point Method ☐Wet Preparation ☐ Dry Preparation ☒ Air Dried ☒

Estimate the % Retained on the #40 Sieve:

Notes / Deviations / References:

Oven Temperature Set at 60C.

ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils

Karen Warner

Technician Name

8/10/12
Date

Kyle Baucom

Technical Responsibility

8/15/12
Date

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Moisture - Density Relationship



ASTM D558, D698, D1557, AASHTO T99, T180

Quality Assurance

S&ME, Inc.~ 9751 Southern Pine Boulevard~Charlotte, NC 28273

Project #:	1356-11-032	Phase 03	Report Date:	8/10/12
Project Name:	Marshall Industrial Landfill No. 1 - Cells 3 & 4		Test Date(s)	8/8-10/12
Client Name:	Duke Energy			
Client Address:	NI			
Boring #:	NA	Sample #:	SG-3	Sample Date:
Location:	Grid C3	Offset:	NI	Depth:
Sample Description:	Black Gray Silt (ML)			
Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #
Balance (0.1 g)	22182	6/8/2012	Compaction Mold	20231
Balance	22182	6/8/2012	Compaction Hammer	20222
Straightedge	20179	8/7/2012	Oven	22151
Sieve	22100	4/3/2012		

Water Content		Water Content requires GP 2 Balance (0.1 gram Readability).					Check:
ASTM D2216 <input checked="" type="checkbox"/>		AASHTO T265 <input type="checkbox"/>		ASTM D4959 <input type="checkbox"/>		ASTM D4643 <input type="checkbox"/>	
Water Added:		350	400	450	500	550	
Tare #:		JDM	G	5A	698	MJD	
A. Tare Weight	A.	159.3	157.3	159.6	154.6	160.3	
B. Wet Wt + Tare Wt	B.	804.9	1097.7	1043.5	1022.3	990.7	
C. Dry Wt. + Tare Wt.	C.	690.1	911.3	856.5	826.0	791.1	
D. Water Weight	B-C	114.8	186.4	187.0	196.3	199.6	
E. Dry Weight	C-A	530.8	754.0	696.9	671.4	630.8	
F. Moisture Content	100*D/E	21.6%	24.7%	26.8%	29.2%	31.6%	
Compaction Data		Requires a GP 5 Balance for ASTM (1 gram or .0022 Lb. readability).					Check:
ASTM D558 <input type="checkbox"/>		ASTM D 698 <input checked="" type="checkbox"/>		ASTM D1557 <input type="checkbox"/>		AASHTO T99 <input type="checkbox"/>	
Method A <input checked="" type="checkbox"/>		Method B <input type="checkbox"/>		Method C <input type="checkbox"/>		Method D (ASTM 1978) <input type="checkbox"/>	
AASHTO T180 <input type="checkbox"/>		AASHTO Method D <input type="checkbox"/>					
G. Wt of Soil + Mold	G.	5637	5698	5749	5748	5722	
H. Wt. of Mold	H.	4241	4241	4241	4241	4241	
I. Wt. of Soil (g. or lbs.)	G-H	1396	1457	1508	1507	1481	
J. Wt of Soil (Lbs.)	1/453.6 or 1	3.078	3.212	3.325	3.322	3.265	
K. Mold Volume Factor	K.	30.09	30.09	30.09	30.09	30.09	
L. Wet Density (PCF)	J*K	92.6	96.6	100.0	100.0	98.2	
M. Dry Density (PCF)	L/(1+F)	76.2	77.5	78.9	77.4	74.6	
Sieve Size used to separate the Oversize Fraction:		#4 Sieve <input checked="" type="checkbox"/>		3/8 inch Sieve <input type="checkbox"/>		3/4 inch Sieve <input type="checkbox"/>	
Mechanical Rammer <input checked="" type="checkbox"/>		Manual Rammer <input type="checkbox"/>		Moist Preparation <input type="checkbox"/>		Dry Preparation <input checked="" type="checkbox"/>	

References / Comments / Deviations: NI = Information not provided. ND = Not determined.

Jennifer Olsen

Technician Name

Signature

NICET / 117926

Certification Type/No.

8/10/2012

Date

Kyle Baucom

Technical Responsibility

Signature

Project Engineer

Position

Date

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Moisture - Density Report



Quality Assurance

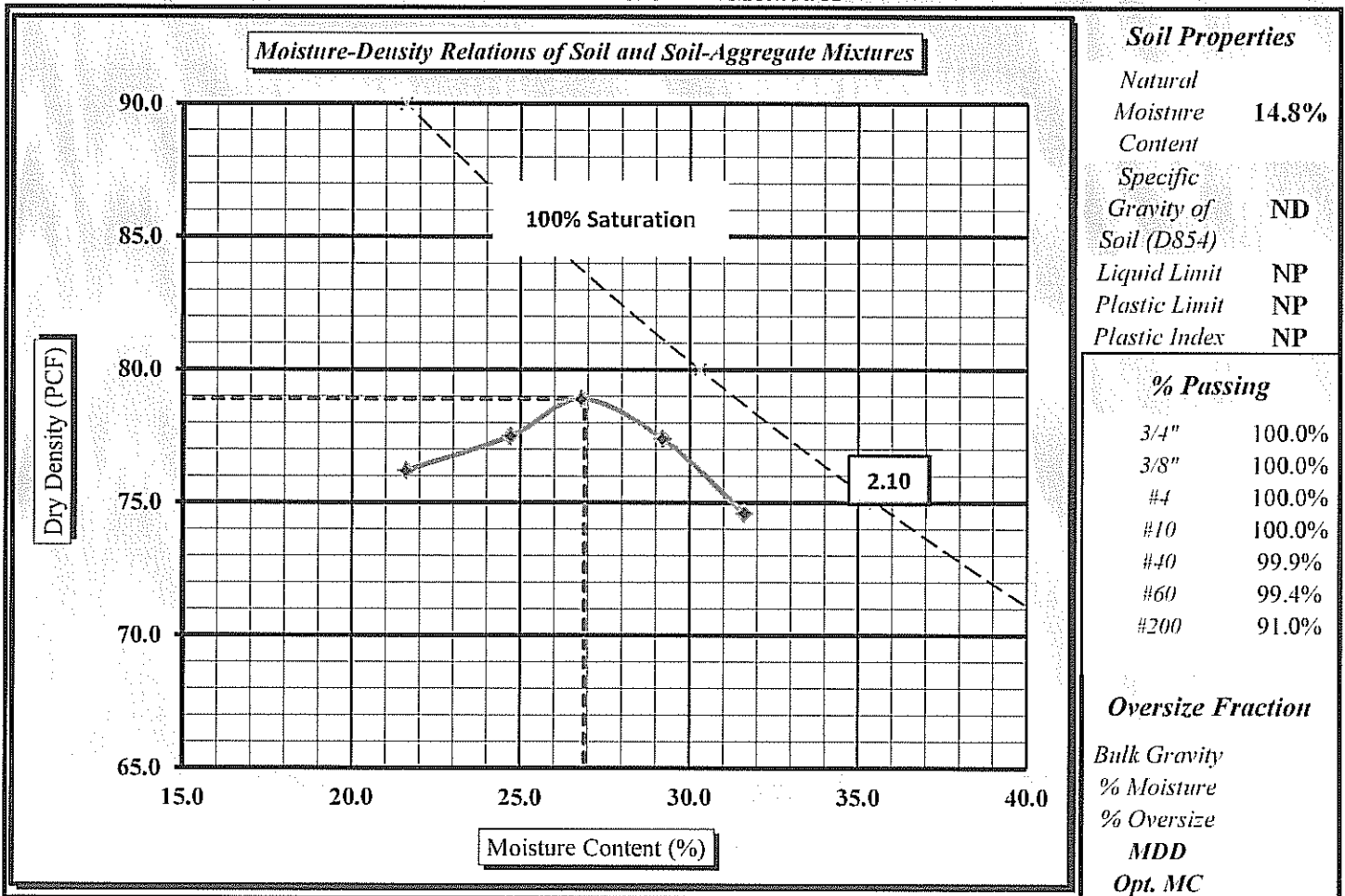
S&ME, Inc.~ 9751 Southern Pine Boulevard~Charlotte, NC 28273

S&ME Project #:	1356-11-032	Phase 03	Report Date:	8/10/12	
Project Name:	Marshall Industrial Landfill No. 1 - Cells 3 & 4		Test Date(s):	8/8-10/12	
Client Name:	Duke Energy				
Client Address:	NI				
Boring #:	NA	Sample #:	SG-3	Sample Date:	7/5/2012
Location:	Grid C3	Offset:	NI	Depth:	NA
Sample Description:	Black Gray Silt (ML)				

Maximum Dry Density 78.9 PCF.

Optimum Moisture Content 26.9%

ASTM D 698 -- Method A



Moisture-Density Curve Displayed: Fine Fraction ☒ Corrected for Oversize Fraction (ASTM D 4718) ☐
 Sieve Size used to separate the Oversize Fraction: #4 Sieve ☒ 3/8 inch Sieve ☐ 3/4 inch Sieve ☐
 Mechanical Rammer ☒ Manual Rammer ☐ Moist Preparation ☐ Dry Preparation ☒

References / Comments / Deviations: NI = Information not provided. ND = Not determined.

Technician Name: Jennifer Olsen *Jennifer Olsen*

Date: 8/10/12

Kyle Baucom
Technical Responsibility

Kyle Baucom
Signature

Project Engineer
Position

8/15/12
Date

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Particle Size Analysis of Soils

ASTM D 422



S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273

Project #: 1356-11-032 Phase 03

Report Date: 8/10/12

Project Name: Marshall Industrial Landfill No. 1 Cells 3&4 Test Date(s): 7/28-8/10/12

Client Name: Duke Energy Address: 526 South Church Street, Charlotte, NC 28202

Boring #: NA Sample #: SG-4 Sample Date: 7/5/12 & 7/12/12 Sieve 3.0" Retained Wt. 0.0

Location: Grid C3 Offset: NA Elevation: NA 1.5" 0.0

Sample Description: Black Gray Silt (ML) 1.0" 0.0

Pan #: Beaker #: Apparent Relative Density (Assumed) 2.200 3/4" 0.0

Hydrometer Jar #: Moisture Content Hygroscopic Natural 1/2" 0.0

Pan Tare Weight (grams): 300.77 Tare # 50 301 3/8" 0.0

Total Sample Air Dried Wt. + tare wt. (grams): 300.77 Tare Wt. 15.77 16.35 #4 0.0

Weight of Total Sample Air Dried: 50.00 Wet Wt. + A 26.42 654.21 #10 0.00

Weight of Air Dried Hydrometer Sample (g): 299.92 Dry Wt. + A 26.39 566.31 #20 0.01

Total Sample Oven Dried: 49.86 Water Wt. (B-C) 0.03 87.90 #40 0.02

Hydrometer Sample Oven Dried (W): 100.0% Dry Wt. (C-A) 10.62 549.96 #60 0.24

% Passing #10: 1.09 % Moisture (100 x D/E) 0.28% 16.0% #100 0.88

Correction Factor a (Table 1): 1.09 Dispersion Time: 1 min. Sodium Hexametaphosphate: 40 g/Liter

Description of Sand & Gravel Particles Rounded ☐ Angular ☐ Hard & Durable ☐ Soft ☐ Weathered & Friable ☐Stirring Apparatus: A ☒ B ☐ Hydrometer: ID No. 3901 Cal. Date: 3/25/2012Balance: ID No. 3222 Cal. Date: 6/25/2012 Type: 151H ☐ 152H ☒Control Cylinder ☒ Composite Correction ☐

Time	Temp.	Hydrometer	Control	Composite	Hydrometer	Percent Passing	Effective	Table 3	Diameter
T (Min.)	(0.5 °C)	Reading	Cylinder	Correction	R	P(#10) = (R x a / W) x 100	P (total) = P x % Passing #10	Depth L	K K x (L/T) ^{1/2}
1	21.5	45.0	5.0		40.00	87.4%	87.4%	9.7	0.01571
2	21.5	40.0	5.0		35.00	76.5%	76.5%	10.6	0.01571
5	21.5	32.5	5.0		27.50	60.1%	60.1%	11.8	0.01571
15	21.5	19.5	5.0		14.50	31.7%	31.7%	13.9	0.01571
30	21.5	14.5	5.0		9.50	20.8%	20.8%	14.7	0.01571
60	21.5	11.5	5.0		6.50	14.2%	14.2%	15.2	0.01571
250	21.5	8.0	5.0		3.00	6.6%	6.6%	15.8	0.01571
1440	21.5	5.5	5.0		0.50	1.1%	1.1%	16.2	0.01571

References / Comments / Deviations ASTM D 422, D 2487, D 4318

Oven Temperature was set at 60C.

Jennifer Olsen/Karen Warner

Technician Name

NICET 117900

Certification #

Kyle Baucum

Technical Responsibility

Project Engineer

Position

8/15/12

Date



ASTM D422

Quality Assurance

S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273

S&ME Project #: 1356-11-032 Phase 03

Report Date: 8/10/12

Project Name: Marshall Industrial Landfill No. 1 Cells 3&4

Test Date(s): 7/28-8/10/12

Client Name: Duke Energy

Address: 526 South Church Street, Charlotte, NC 28202

Boring #: NA

Sample #: SG-4

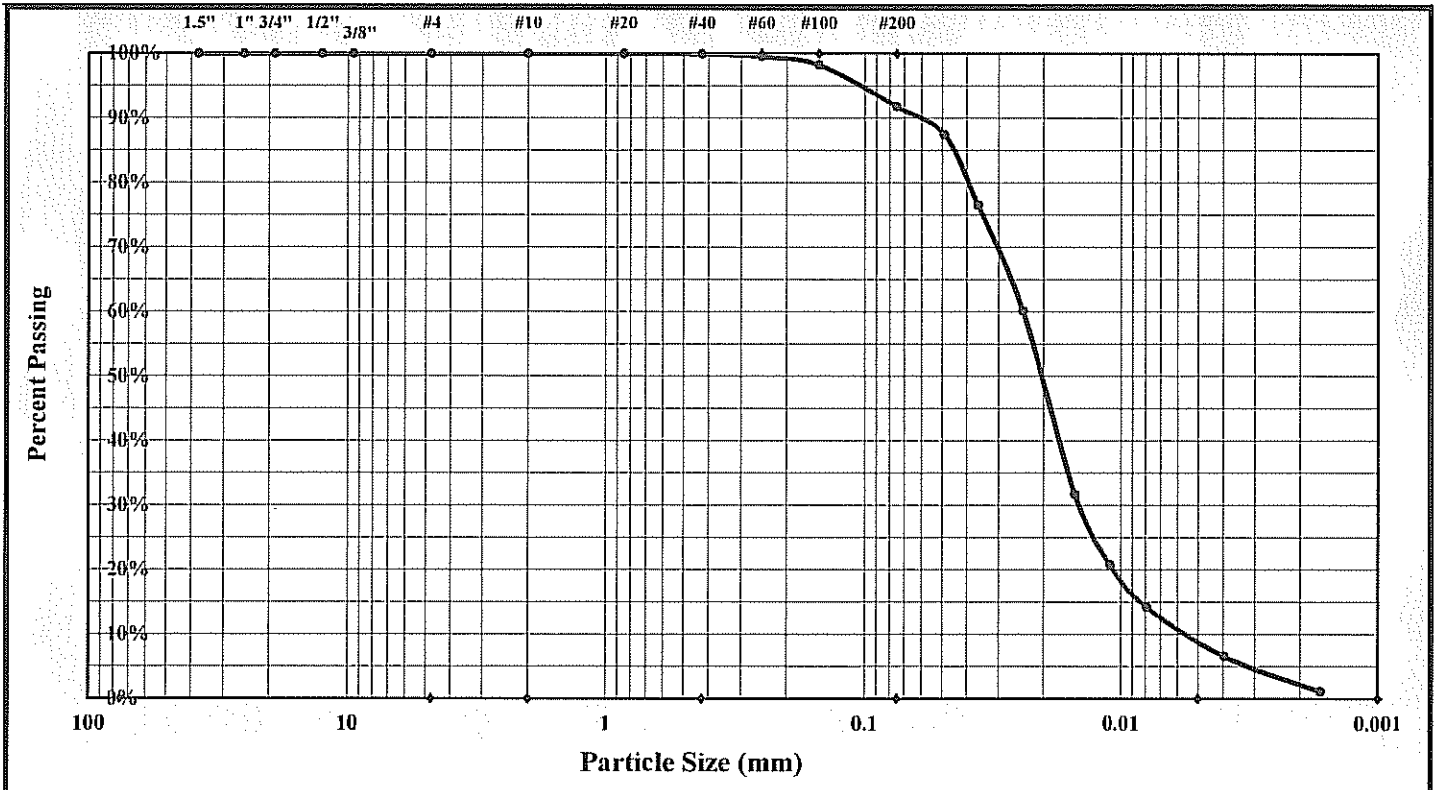
Sample Date: 7/5/12 & 7/12/12

Location: Grid C3

Offset: NA

Elevation: NA

Sample Description: Black Gray Silt (ML)



Cobbles	< 300 mm (12") and > 75 mm (3")	Fine Sand	< 0.425 mm and > 0.075 mm (#200)
Gravel	< 75 mm and > 4.75 mm (#4)	Silt	< 0.075 and > 0.005 mm
Coarse Sand	< 4.75 mm and > 2.00 mm (#10)	Clay	< 0.005 mm
Medium Sand	< 2.00 mm and > 0.425 mm (#40)	Colloids	< 0.001 mm

Maximum Particle Size:	#20	Gravel:	0.0%	Silt	83.3%
Silt & Clay (% Passing #200):	91.8%	Total Sand:	8.2%	Clay	8.5%
Unit Relative Density (Assumed)	2.200	Moisture Content	16.0%	Colloids	
Liquid Limit	NP	Plastic Limit	NP	Plastic Index	NP
Coarse Sand:	0.0%	Medium Sand:	0.0%	Fine Sand:	8.2%

Description of Sand and Gravel	Rounded <input type="checkbox"/>	Angular <input type="checkbox"/>	Hard & Durable <input type="checkbox"/>	Soft <input type="checkbox"/>	Weathered & Friable <input type="checkbox"/>
--------------------------------	----------------------------------	----------------------------------	---	-------------------------------	--

Mechanical Stirring Apparatus A	Dispersion Period:	1 min.	Dispersing Agent:	Sodium Hexametaphosphate:	40 g./ Liter
---------------------------------	--------------------	--------	-------------------	---------------------------	--------------


References / Comments / Deviations: 1 ASTM D 4318, D 854, D 2487

Technician Name: John Wilson

Date: 8/10/12

Kyle Baucom

Technical Responsibility


Signature

Project Engineer

Position

2/5/12
Date

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Moisture - Density Relationship



ASTM D558, D698, D1557, AASHTO T99, T180

Quality Assurance

S&ME, Inc.~ 9751 Southern Pine Boulevard~Charlotte, NC 28273

Project #:	1356-11-032	Phase 03	Report Date:	8/10/12
Project Name:	Marshall Industrial Landfill No. 1 - Cells 3 & 4		Test Date(s)	8/8-10/12
Client Name:	Duke Energy			
Client Address:	NI			
Boring #:	NI	Sample #:	SG-4	Sample Date:
Location:	Grid C3	Offset:	NI	Depth:
Sample Description:	Black Gray Silt (ML)			
Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #
Balance (0.1 g)	22182	6/8/2012	Compaction Mold	20231
Balance	22182	6/8/2012	Compaction Hammer	20222
Straightedge	20179	8/7/2012	Oven	22151
Sieve	22100	4/3/2012		

Water Content		Water Content requires GP 2 Balance (0.1 gram Readability).				Check:	
ASTM D2216 <input checked="" type="checkbox"/>		AASHTO T265 <input type="checkbox"/>		ASTM D4959 <input type="checkbox"/>		ASTM D4643 <input type="checkbox"/>	
Water Added:		400	450	350	300		
Tare #:		5B	6910	BE	JMD		
A. Tare Weight	A.	160.3	155.7	163.9	163.6		
B. Wet Wt + Tare Wt	B.	1045.7	949.9	1035.6	979.9		
C. Dry Wt. + Tare Wt.	C.	865.9	774.7	870.3	840.3		
D. Water Weight	B-C	179.8	175.2	165.3	139.6		
E. Dry Weight	C-A	705.6	619.0	706.4	676.7		
F. Moisture Content	100*D/E	25.5%	28.3%	23.4%	20.6%		
Compaction Data		Requires a GP 5 Balance for ASTM (1 gram or .0022 Lb. readability).				Check:	
ASTM D558 <input type="checkbox"/>		ASTM D 698 <input checked="" type="checkbox"/>		ASTM D1557 <input type="checkbox"/>		AASHTO T99 <input type="checkbox"/>	
Method A <input checked="" type="checkbox"/>		Method B <input type="checkbox"/>		Method C <input type="checkbox"/>		Method D (ASTM 1978) <input type="checkbox"/>	
AASHTO T180 <input type="checkbox"/>		AASHTO Method D <input type="checkbox"/>					
G. Wt of Soil + Mold	G.	5786	5765	5734	5673		
H. Wt. of Mold	H.	4241	4241	4241	4241		
I. Wt. of Soil (g. or lbs.)	G-H	1545	1524	1493	1432		
J. Wt of Soil (Lbs.)	I/453.6 or I	3.406	3.360	3.291	3.157		
K. Mold Volume Factor	K.	30.09	30.09	30.09	30.09		
L. Wet Density (PCF)	J*K	102.5	101.1	99.0	95.0		
M. Dry Density (PCF)	L/(1+F)	81.7	78.8	80.2	78.8		
Sieve Size used to separate the Oversize Fraction:		#4 Sieve <input checked="" type="checkbox"/>		3/8 inch Sieve <input type="checkbox"/>		3/4 inch Sieve <input type="checkbox"/>	
Mechanical Rammer <input checked="" type="checkbox"/>		Manual Rammer <input type="checkbox"/>		Moist Preparation <input type="checkbox"/>		Dry Preparation <input checked="" type="checkbox"/>	

References / Comments / Deviations: NI = Information not provided. ND = Not determined.

Jennifer Olsen

Technician Name

Signature

NICET / 117926

Certification Type/No.

8/10/2012

Date

Kyle Baucom

Technical Responsibility

Signature

Project Engineer

Position

8/15/12

Date

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Moisture - Density Report



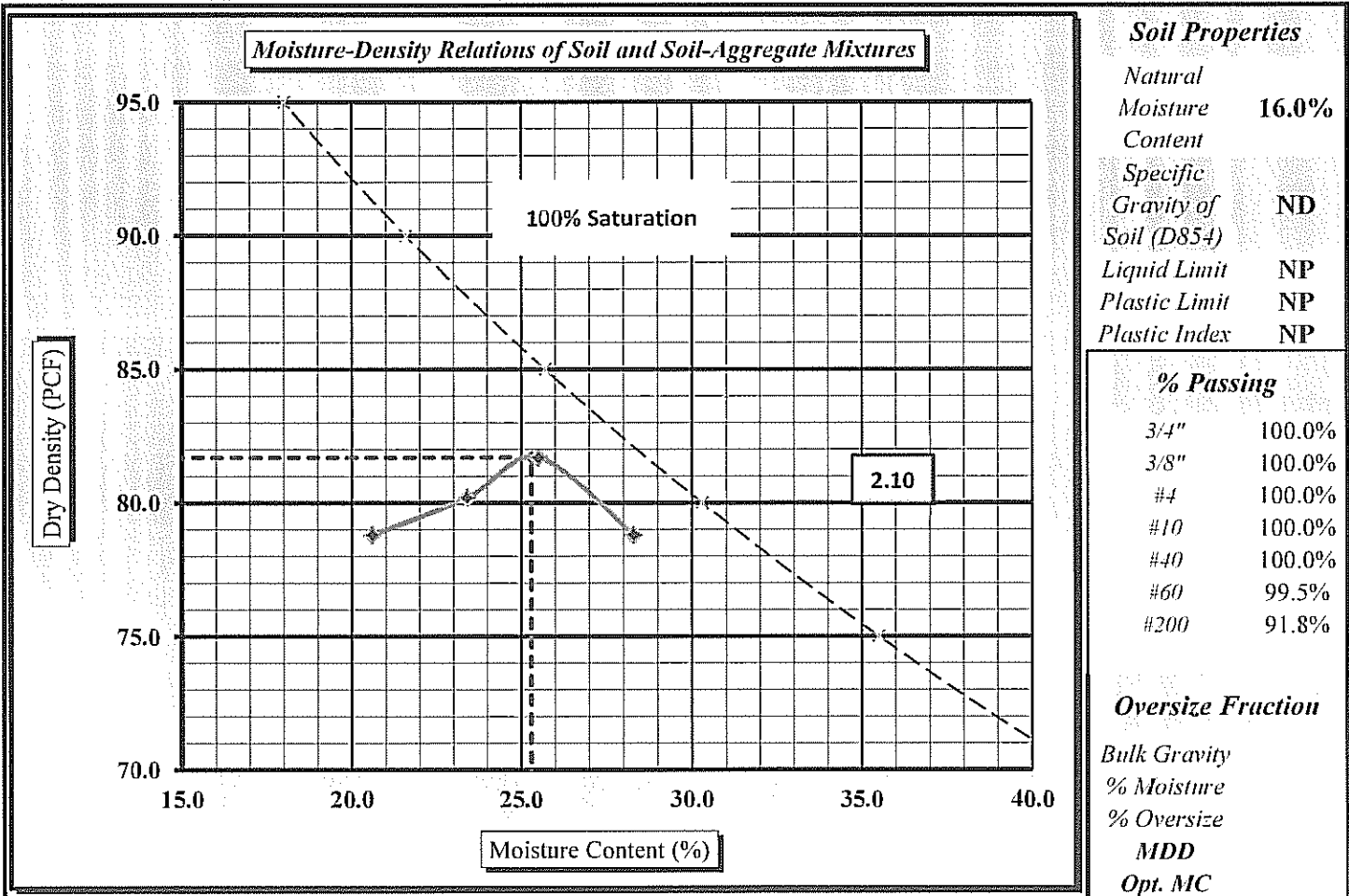
Quality Assurance

S&ME, Inc.~ 9751 Southern Pine Boulevard~Charlotte, NC 28273

S&ME Project #:	1356-11-032	Phase 03	Report Date:	8/10/12	
Project Name:	Marshall Industrial Landfill No. 1 - Cells 3 & 4		Test Date(s):	8/8-10/12	
Client Name:	Duke Energy				
Client Address:	NI				
Boring #:	NI	Sample #:	SG-4	Sample Date:	7/12/2012
Location:	Grid C3	Offset:	NI	Depth:	NI
Sample Description:	Black Gray Silt (ML)				

Maximum Dry Density 81.7 PCF. Optimum Moisture Content 25.3%

ASTM D 698 -- Method A



Moisture-Density Curve Displayed: Fine Fraction ☒ Corrected for Oversize Fraction (ASTM D 4718) ☐
 Sieve Size used to separate the Oversize Fraction: #4 Sieve ☒ 3/8 inch Sieve ☐ 3/4 inch Sieve ☐
 Mechanical Rammer ☒ Manual Rammer ☐ Moist Preparation ☐ Dry Preparation ☒

References / Comments / Deviations: NI = Information not provided. ND = Not determined.

Technician Name: Jennifer Olsen *Jennifer Olsen*

Date: 8/10/12

Kyle Baucom
Technical Responsibility

Kyle Baucom
Signature

Project Engineer
Position

8/15/12
Date

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Liquid Limit, Plastic Limit, and Plastic Index



Another code

ASTM D 4318 ☒AASHTO T 89 ☐AASHTO T 90 ☐

Quality Assurance

S&ME, Inc. ~9751 Southern Pine Boulevard, Charlotte, NC 28273

Project #: 1356-11-032 Phase 03

Report Date: 8/10/12

Project Name: Marshall Industrial Landfill No.1- Cells 3&4

Test Date(s) 7/28-8/10/12

Client Name: Duke Energy

Client Address: 526 South Church Street, Charlotte, NC 28202

Boring #: NA

Sample #: SG-4

Sample Date: 7/5/12 & 7/12/12

Location: Grid C3

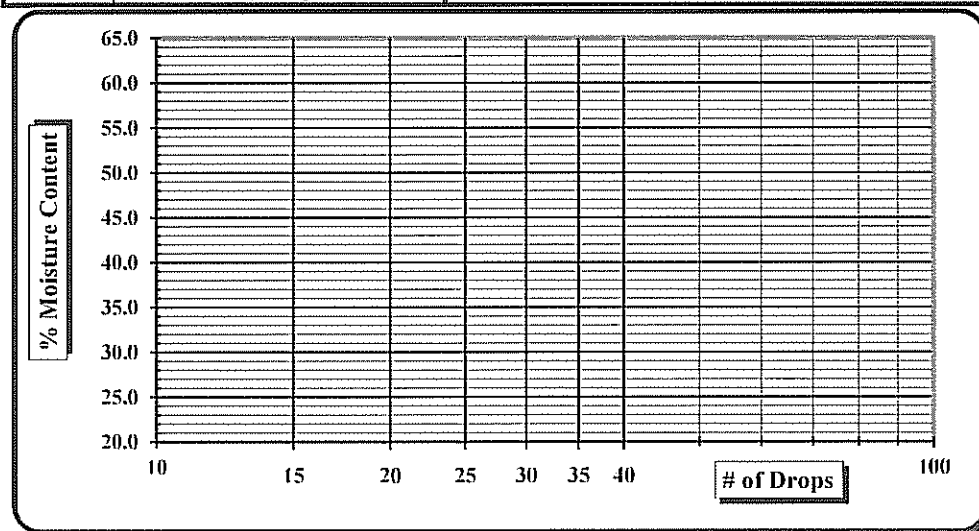
Offset: NA

Elevation: NA

Sample Description: Black Gray Silt (ML)

Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #	Cal Date:
Balance (0.01 g)	3222	6/25/2012	Grooving tool	20165	12/20/2012
LL Apparatus	20230	6/26/2012	Grooving tool		
Oven	10844	5/9/2012	Grooving tool		

Pan #	Tare #:	Liquid Limit						Plastic Limit		
A	Tare Weight									
B	Wet Soil Weight + A									
C	Dry Soil Weight + A									
D	Water Weight (B-C)									
E	Dry Soil Weight (C-A)									
F	% Moisture (D/E)*100									
N	# OF DROPS							Moisture Contents determined by ASTM D 2216		
LL	LL = F * FACTOR									
Ave.	Average									



One Point Liquid Limit			
N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic ☒

Liquid Limit

Plastic Limit

Plastic Index

Group Symbol ML

Multipoint Method ☒One-point Method ☐Wet Preparation ☐ Dry Preparation ☒ Air Dried ☒

Estimate the % Retained on the #40 Sieve:

Notes / Deviations / References:

Oven Temperature Set at 60C.

ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils

Karen Warner

Technician Name

Date

Kyle Baucom

Technical Responsibility

Date

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Laboratory Determination of Water Content



ASTM D 2216



AASHTO T 265



Quality Assurance

S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273

Project #:	1356-11-032	Phase 03	Report Date:	8/7/12
Project Name:	Marshall Industrial Landfill No. 1 - Cells 3 & 4		Test Date(s):	8/3-7/12
Client Name:	Duke Energy			
Client Address:	526 South Church Street, Charlotte, NC 28202			
Sample by:	Jimmy Addis	Sample Date(s):	7/25/12	
Sampling Method:	NI	Drill Rig :	NI	
Method:	A (1%) <input type="checkbox"/>	B (0.1%) <input checked="" type="checkbox"/>	Balance ID:	3222
			Calibration Date:	6/25/12

[illegible]

Notes / Deviations / References NI = No information provided.

Was no baggie or jar, so moisture sample was taken from the bottom of the bucket.

ASTM D 2216: Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass


Jennifer Olsen
Technician Name

Signature

NICET / 117926
Certification Type / No.

8/7/2012
Date

Kyle Baucom
Technical Responsibility


Signature

Project Engineer
Position

8/15/12
Date

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Particle Size Analysis of Soils

ASTM D 422



S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273

Project #: 1356-11-032 Phase 03

Report Date: 8/10/12

Project Name: Marshall Industrial Landfill No. 1-Cells 3&4 Test Date(s): 7/25/12-8/10/12

Client Name: Duke Energy Address: 526 South Church Street, Charlotte, NC 28202

Boring #: NA Sample #: SG-5 Sample Date: 7/25/12 Sieve 3.0" Retained Wt. 0.0

Location: Grid B2 Offset: NA Elevation: NA Sample Date: 7/25/12 Sieve 1.5" Retained Wt. 0.0

Sample Description: Black Gray Silt (ML) Apparent Relative Density (Assumed) 2.200 Sieve 1.0" Retained Wt. 0.0

Pan #: Beaker #: Apparent Relative Density (Assumed) 2.200 Sieve 3/4" Retained Wt. 0.0

Hydrometer Jar #: Moisture Content Hygroscopic Natural 3/8" 0.0

Pan Tare Weight (grams): 236.62 Tare # 5 #4 0.0

Total Sample Air Dried Wt. + tare wt. (grams): 236.62 Tare Wt. 15.74 16.38 #10 0.00

Weight of Total Sample Air Dried: 236.62 A Tare Wt. 15.74 16.38 #10 0.00

Weight of Air Dried Hydrometer Sample (g): 50.00 B Wet Wt. + A 27.03 399.68 #20 0.02

Total Sample Oven Dried: 235.15 C Dry Wt. + A 26.96 318.49 #40 0.11

Hydrometer Sample Oven Dried (W): 49.69 D Water Wt. (B-C) 0.07 81.19 #60 0.93

% Passing #10: 100.0% E Dry Wt. (C-A) 11.22 302.11 #100 1.63

Correction Factor a (Table I): 1.09 % Moisture (100 x D/E) 0.62% 26.9% #200 5.26

Description of Sand & Gravel Particles Rounded ☐ Angular ☒ Hard & Durable ☒ Soft ☐ Weathered & Friable ☐

Stirring Apparatus: A ☒ B ☐ Dispersion Time: 1 min. Sodium Hexametaphosphate: 40 g./ Liter

Balance: ID No. 3222 Cal. Date: 6/25/2012 Hydrometer: ID No. 3901 Cal. Date: 3/25/2012

Control Cylinder ☒ Composite Correction ☐ Type: 151H ☐ 152H ☒

Time	Temp.	Hydrometer	Control	Corrections	Hydrometer	Percent Passing	Effective	Table 3	Diameter
T (Min.)	(0.5 °C)	Reading	Cylinder	Composite Correction	R	P (#10) = (R x a / W) x 100	P (total) = P x % Passing #10	Depth	D = K x (L/T) ^{1/2}
1	21.5	42.0	5.0		37.00	81.2%	81.2%	10.2	0.01571
2	21.5	38.0	5.0		33.00	72.4%	72.4%	10.9	0.01571
5	21.5	26.5	5.0		21.50	47.2%	47.2%	12.8	0.01571
15	21.5	15.0	5.0		10.00	21.9%	21.9%	14.7	0.01571
30	21.5	11.5	5.0		6.50	14.3%	14.3%	15.2	0.01571
60	21.5	10.0	5.0		5.00	11.0%	11.0%	15.5	0.01571
250	21.5	6.5	5.0		1.50	3.3%	3.3%	16.0	0.01571
1440	21.5	5.5	5.0		0.50	1.1%	1.1%	16.2	0.01571

References / Comments / Deviations ASTM D 422, D 2487, D 4318

Oven Temperature Set at 60C.

Karen Warner
Technician Name

NICET 117900
Certification #

Kyle Baucum
Technical Responsibility

Project Engineer
Position

8/15/12
Date



Particle Size Analysis of Soils

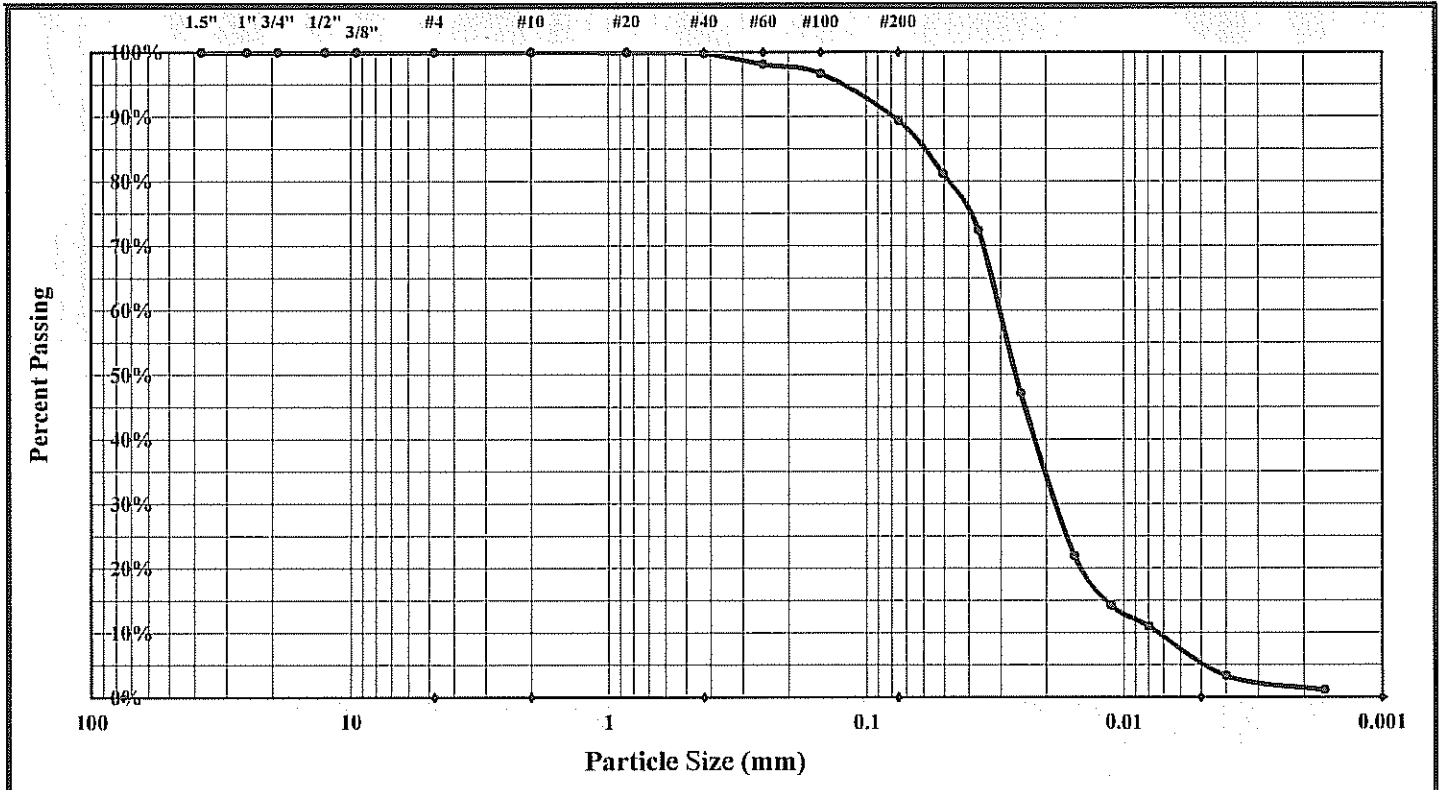
ASTM D422

Quality Assurance

S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273

S&ME Project #:	1356-11-032 Phase 03		Report Date:	8/10/12	
Project Name:	Marshall Industrial Landfill No.1-Cells 3&4		Test Date(s):	7/25/12-8/10/12	
Client Name:	Duke Energy				
Address:	526 South Church Street, Charlotte, NC 28202				
Boring #:	NA	Sample #:	SG-5	Sample Date:	7/25/12
Location:	Grid B2	Offset:	NA	Elevation:	NA

Sample Description: Black Gray Silt (ML)



Cobbles	< 300 mm (12") and > 75 mm (3")	Fine Sand	< 0.425 mm and > 0.075 mm (#200)
Gravel	< 75 mm and > 4.75 mm (#4)	Silt	< 0.075 and > 0.005 mm
Coarse Sand	< 4.75 mm and > 2.00 mm (#10)	Clay	< 0.005 mm
Medium Sand	< 2.00 mm and > 0.425 mm (#40)	Colloids	< 0.001 mm


Maximum Particle Size:	#20	Gravel:	0.0%	Silt	84.3%
Silt & Clay (% Passing #200):	89.4%	Total Sand:	10.6%	Clay	5.1%
Unit Relative Density (Assumed)	2.200	Moisture Content	26.9%	Colloids	
Liquid Limit	NP	Plastic Limit	NP	Plastic Index	NP
Coarse Sand:	0.0%	Medium Sand:	0.2%	Fine Sand:	10.4%

Description of Sand and Gravel	Rounded <input type="checkbox"/>	Angular <input checked="" type="checkbox"/>	Hard & Durable <input checked="" type="checkbox"/>	Soft <input type="checkbox"/>	Weathered & Friable <input type="checkbox"/>
Mechanical Stirring Apparatus A	Dispersion Period:	1 min.	Dispersing Agent:	Sodium Hexametaphosphate:	40 g / Liter

References / Comments / Deviations: ASTM D 4318, D 854, D 2487

Technician Name: James Williams Date: 8/10/12

Kyle Baucom
Technical Responsibility


Signature

Project Engineer
Position

8/15/12
Date

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Liquid Limit, Plastic Limit, and Plastic Index



Another code

ASTM D 4318



AASHTO T 89



AASHTO T 90



Quality Assurance

S&ME, Inc. ~9751 Southern Pine Boulevard, Charlotte, NC 28273

Project #: 1356-11-032 Phase 03

Report Date: 8/10/12

Project Name: Marshall Industrial Landfill No.1- Cells 3&4

Test Date(s) 7/28-8/10/12

Client Name: Duke Energy

Client Address: 526 South Church Street, Charlotte, NC 28202

Boring #: NA

Sample #: SG-5

Sample Date: 7/25/12

Location: Grid C3

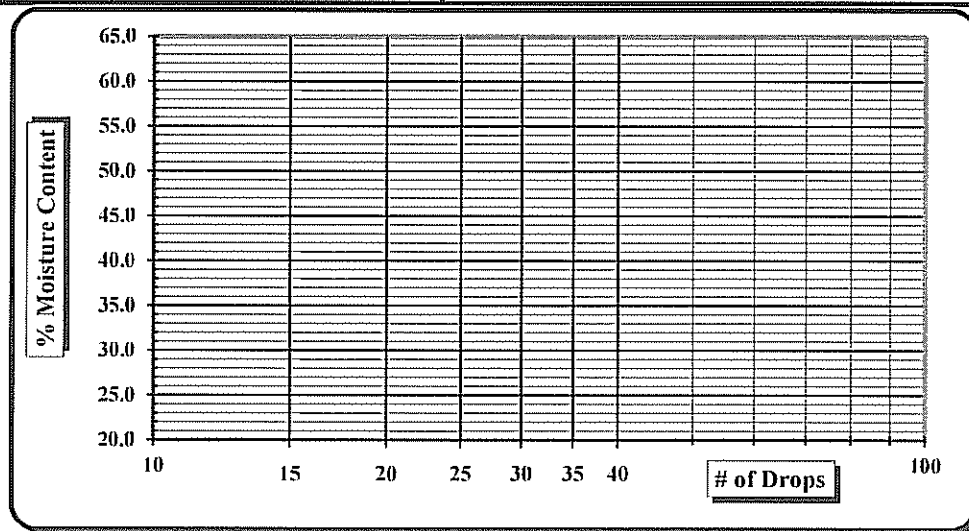
Offset: NA

Elevation: NA

Sample Description: Black Gray Silt (ML)

Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #	Cal Date:
Balance (0.01 g)	3222	6/25/2012	Grooving tool	20165	12/20/2012
LL Apparatus	20230	6/26/2012	Grooving tool		
Oven	10844	5/9/2012	Grooving tool		

Pan #	Tare #:	Liquid Limit				Plastic Limit		
A	Tare Weight							
B	Wet Soil Weight + A							
C	Dry Soil Weight + A							
D	Water Weight (B-C)							
E	Dry Soil Weight (C-A)							
F	% Moisture (D/E)*100							
N	# OF DROPS					Moisture Contents determined by ASTM D 2216		
LL	LL = F * FACTOR							
Ave.	Average							



One Point Liquid Limit			
N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic ☒

Liquid Limit

Plastic Limit

Plastic Index

Group Symbol ML

Multipoint Method ☒One-point Method ☐Wet Preparation ☐ Dry Preparation ☒ Air Dried ☒

Estimate the % Retained on the #40 Sieve:

Notes / Deviations / References:

Oven Temperature Set at 60C.

ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils

Karen Warner

Technician Name

8/10/12

Date

Kyle Baucom

Technical Responsibility

8/15/12

Date

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Moisture - Density Relationship



ASTM D558, D698, D1557, AASHTO T99, T180

Quality Assurance

S&ME, Inc.~ 9751 Southern Pine Boulevard~Charlotte, NC 28273

Project #:	1356-11-032	Phase 03	Report Date:	8/10/12
Project Name:	Marshall Industrial Landfill No. 1 - Cells 3 & 4		Test Date(s)	8/8-10/12
Client Name:	Duke Energy			
Client Address:	NI			
Boring #:	NI	Sample #:	SG-5	Sample Date:
Location:	Grid B2	Offset:	NI	Depth: NI
Sample Description:	Black Gray Silt (ML)			
Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID # Cal Date:
Balance (0.1 g)	22182	6/8/2012	Compaction Mold	20231 1/6/2012
Balance	22182	6/8/2012	Compaction Hammer	20222 6/6/2012
Straightedge	20179	8/7/2012	Oven	22151 7/13/2012
Sieve	22100	4/3/2012		

Water Content		Water Content requires GP 2 Balance (0.1 gram Readability).					Check:	
ASTM D2216 <input checked="" type="checkbox"/>		AASHTO T265 <input type="checkbox"/>		ASTM D4959 <input type="checkbox"/>		ASTM D4643 <input type="checkbox"/>		
Water Added:		200	250	300	350	400		
Tare #:		PTL	HK	CJ	5L	GH		
A. Tare Weight	A.	169.7	160.8	154.9	156.2	164.5		
B. Wet Wt + Tare Wt	B.	961.4	963.4	1033.7	1037.3	970.7		
C. Dry Wt. + Tare Wt.	C.	802.4	787.0	828.3	818.0	758.3		
D. Water Weight	B-C	159.0	176.4	205.4	219.3	212.4		
E. Dry Weight	C-A	632.7	626.2	673.4	661.8	593.8		
F. Moisture Content	100*D/E	25.1%	28.2%	30.5%	33.1%	35.8%		
Compaction Data		Requires a GP 5 Balance for ASTM (1 gram or .0022 Lb. readability).					Check:	
ASTM D558 <input type="checkbox"/>		ASTM D 698 <input checked="" type="checkbox"/>		ASTM D1557 <input type="checkbox"/>		AASHTO T99 <input type="checkbox"/>		AASHTO T180 <input type="checkbox"/>
Method A <input checked="" type="checkbox"/>		Method B <input type="checkbox"/>		Method C <input type="checkbox"/>		Method D (ASTM 1978) <input type="checkbox"/>		AASHTO Method D <input type="checkbox"/>
G. Wt of Soil + Mold	G.	5564	5617	5662	5693	5676		
H. Wt. of Mold	H.	4241	4241	4241	4241	4241		
I. Wt. of Soil (g. or lbs.)	G-H	1323	1376	1421	1452	1435		
J. Wt of Soil (Lbs.)	1/453.6 or 1	2.917	3.034	3.133	3.201	3.164		
K. Mold Volume Factor	K.	30.09	30.09	30.09	30.09	30.09		
L. Wet Density (PCF)	J*K	87.8	91.3	94.3	96.3	95.2		
M. Dry Density (PCF)	L/(1+F)	70.2	71.2	72.3	72.4	70.1		
Sieve Size used to separate the Oversize Fraction:		#4 Sieve <input checked="" type="checkbox"/>		3/8 inch Sieve <input type="checkbox"/>		3/4 inch Sieve <input type="checkbox"/>		
Mechanical Rammer <input checked="" type="checkbox"/>		Manual Rammer <input type="checkbox"/>		Moist Preparation <input type="checkbox"/>		Dry Preparation <input checked="" type="checkbox"/>		

References / Comments / Deviations: NI = Information not provided. ND = Not determined.

Jennifer Olsen

Technician Name

Signature

NICET / 117926

Certification Type/No.

8/10/2012

Date

Kyle Baucom

Technical Responsibility

Signature

Position

8/15/12

Date

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Moisture - Density Report



Quality Assurance

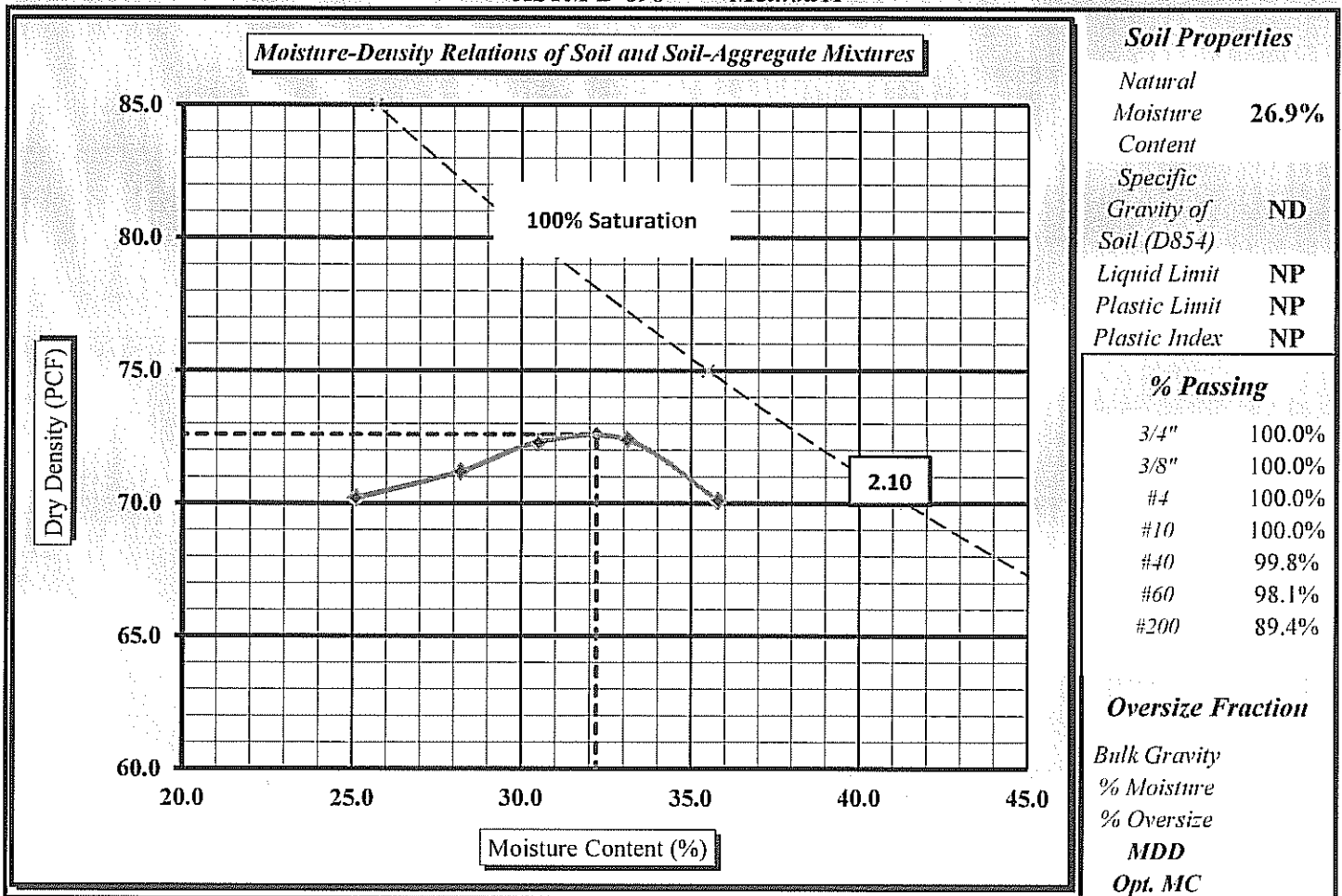
S&ME, Inc.~ 9751 Southern Pine Boulevard~Charlotte, NC 28273

S&ME Project #:	1356-11-032	Phase 03	Report Date:	8/10/12
Project Name:	Marshall Industrial Landfill No. 1 - Cells 3 & 4		Test Date(s):	8/8-10/12
Client Name:	Duke Energy			
Client Address:	NI			
Boring #:	NI	Sample #:	SG-5	Sample Date:
Location:	Grid B2	Offset:	NI	Depth: NI
Sample Description:	Black Gray Silt (ML)			

Maximum Dry Density 72.6 PCF.

Optimum Moisture Content 32.2%

ASTM D 698 - - Method A



Moisture-Density Curve Displayed: Fine Fraction ☒ Corrected for Oversize Fraction (ASTM D 4718) ☐
 Sieve Size used to separate the Oversize Fraction: #4 Sieve ☒ 3/8 inch Sieve ☐ 3/4 inch Sieve ☐
 Mechanical Rammer ☒ Manual Rammer ☐ Moist Preparation ☐ Dry Preparation ☒

References / Comments / Deviations: NI = Information not provided. ND = Not determined.

Technician Name: Jennifer Olsen *Jennifer Olsen* Date: 8/10/12

Kyle Baucom
Technical Responsibility

Kyle Baucom
Signature

Project Engineer
Position

8/15/12
Date

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Liquid Limit, Plastic Limit, and Plastic Index



Another code

ASTM D 4318 ☒AASHTO T 89 ☐AASHTO T 90 ☐

Quality Assurance

S&ME, Inc. ~9751 Southern Pine Boulevard, Charlotte, NC 28273

Project #: 1356-11-032 Phase 03

Report Date: 9/7/12

Project Name: Marshall Industrial Landfill No.1-Cells 3 & 4

Test Date(s) 8/30-9/7/12

Client Name: Duke Energy

Client Address: 526 South Church Street, Charlotte, NC 28202

Boring #: NA

Sample #: SG-6

Sample Date: 8/15/12

Location: Grid D3

Offset: NA

Elevation: NA

Sample Description:

Gray Black Silt (ML)

Fly Ash

Type and Specification

S&ME ID #

Cal Date:

Type and Specification

S&ME ID #

Cal Date:

Balance (0.01 g)

3222

6/25/2012

Grooving tool

20165

12/20/2011

LL Apparatus

20230

6/26/2012

Grooving tool

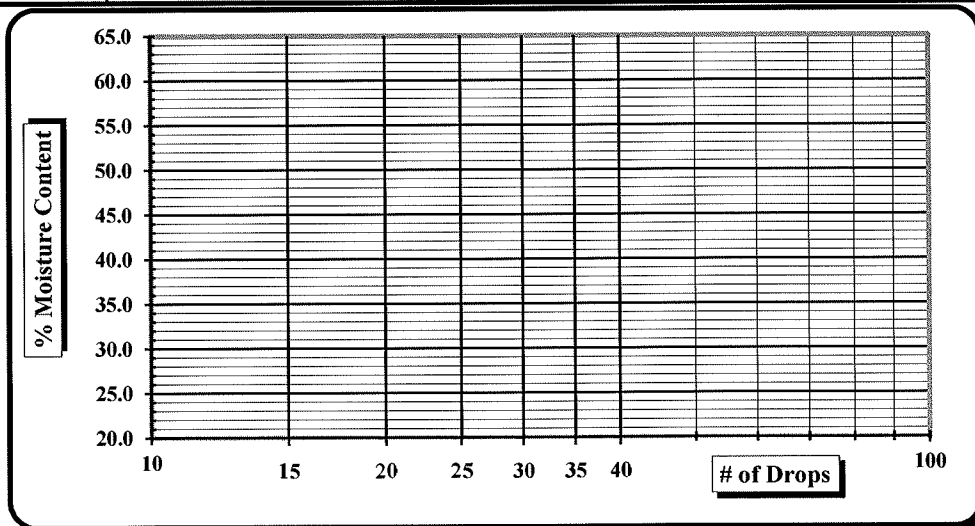
Oven

10844

5/9/2012

Grooving tool

Pan #		Liquid Limit						Plastic Limit		
Tare #:										
A	Tare Weight									
B	Wet Soil Weight + A									
C	Dry Soil Weight + A									
D	Water Weight (B-C)									
E	Dry Soil Weight (C-A)									
F	% Moisture (D/E)*100									
N	# OF DROPS							Moisture Contents determined by ASTM D 2216		
LL	LL = F * FACTOR									
Ave.	Average									



One Point Liquid Limit			
N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic ☒

Liquid Limit

Plastic Limit

Plastic Index

Group Symbol ML

Multipoint Method ☐One-point Method ☐Wet Preparation ☐Dry Preparation ☒Air Dried ☒

Estimate the % Retained on the #40 Sieve:

Notes / Deviations / References:

Oven Temperature Set at 60C.

ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils

Karen Warner

Technician Name

9/7/12

Date

Kyle Baucom

Technical Responsibility

9/7/12

Date

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Particle Size Analysis of Soils



Project #: 1356-11-032 Phase 03

S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273
Report Date: 9/7/12

Project Name: Marshall Industrial Landfill No. 1 Cells - 3 & 4 Test Date(s): 8/30-9/7/12

Client Name: Duke Energy

Address: 526 South Church Street, Charlotte, NC 28202

Boring #: NA

Sample #: SG-6

Sample Date: 8/1/512

Sieve 3.0"

Retained Wt. 0.0

Percent Passing 100.0%

Location: Grid D3

Offset: NA

Elevation: NA

Sieve 1.5"

Retained Wt. 0.0

Percent Passing 100.0%

Sample Description: Gray Black Silt (ML)

Fly Ash

Sieve 1.0"

Retained Wt. 0.0

Percent Passing 100.0%

Pan #: Beaker #:

Apparent Relative Density (Assumed) 2.200

Sieve 3/4"

Retained Wt. 0.0

Percent Passing 100.0%

Hydrometer Jar #:

Moisture Content

Sieve 1/2"

Retained Wt. 0.0

Percent Passing 100.0%

Pan Tare Weight (grams):

Moisture Content

Sieve 3/8"

Retained Wt. 0.0

Percent Passing 100.0%

Total Sample Air Dried Wt. + tare wt. (grams):

Moisture Content

Sieve #4

Retained Wt. 0.0

Percent Passing 100.0%

Weight of Total Sample Air Dried:

Tare # 7

Sieve #10

Retained Wt. 0.00

Percent Passing 100.0%

Weight of Air Dried Hydrometer Sample (g):

Tare Wt. 15.74

Sieve #20

Retained Wt. 0.00

Percent Passing 100.0%

Total Sample Oven Dried:

Wet Wt. + A 27.06

Sieve #40

Retained Wt. 0.04

Percent Passing 99.9%

Hydrometer Sample Oven Dried (W):

Dry Wt. + A 27.00

Sieve #60

Retained Wt. 0.28

Percent Passing 99.4%

% Passing #10:

Water Wt. (B-C) 0.06

Sieve #100

Retained Wt. 1.43

Percent Passing 97.1%

Correction Factor a (Table 1):

Dry Wt. (C-A) 11.26

Sieve #200

Retained Wt. 5.33

Percent Passing 89.3%

Description of Sand & Gravel Particles

% Moisture (100 x D/E) 0.53%

Hard & Durable

Soft

Weathered & Friable

Stringing Apparatus: A

Rounded

Angular

Dispersion Time: 1 min.

Sodium Hexametaphosphate: 40 g./ Liter

Balance: ID No. 3222

Cal. Date: 6/25/2012

Hydrometer: ID No. 3901

Cal. Date: 3/25/2012

Control Cylinder ☒ Composite Correction ☐

Type: 151H

152H

Time	Temp.	Hydrometer	Control	Composite	Hydrometer	Percent Passing	Effective	Table 3	Diameter
T (Min.)	(0.5 °C)	Reading	Cylinder	Correction	R	P(#10) = (R x a / W) x 100	Depth	K	D = K x (L/T) ^{1/2}
1	24.0	42.5	4.5		38.00	83.2%	10.1	0.01526	0.04839
2	24.0	39.0	4.5		34.50	75.5%	10.6	0.01526	0.03518
5	24.0	23.0	4.5		18.50	40.5%	13.3	0.01526	0.02484
15	24.0	14.5	4.5		10.00	21.9%	14.7	0.01526	0.01508
30	24.0	11.0	4.5		6.50	14.2%	15.2	0.01526	0.01087
60	24.0	10.0	4.5		5.50	12.0%	15.4	0.01526	0.00773
250	24.0	7.5	4.5		3.00	6.6%	15.8	0.01526	0.00384
1440	23.5	6.0	4.5		1.50	3.3%	16.0	0.01535	0.00162

References / Comments / Deviations ASTM D 422, D 2487, D 4318

Oven Temperature Set at 60C.

Karen Warner
Technician Name

NICET 117900
Certification #

Kyle Baucum
Technical Responsibility

Project Engineer
Position

9/7/12
Date

Particle Size Analysis of Soils

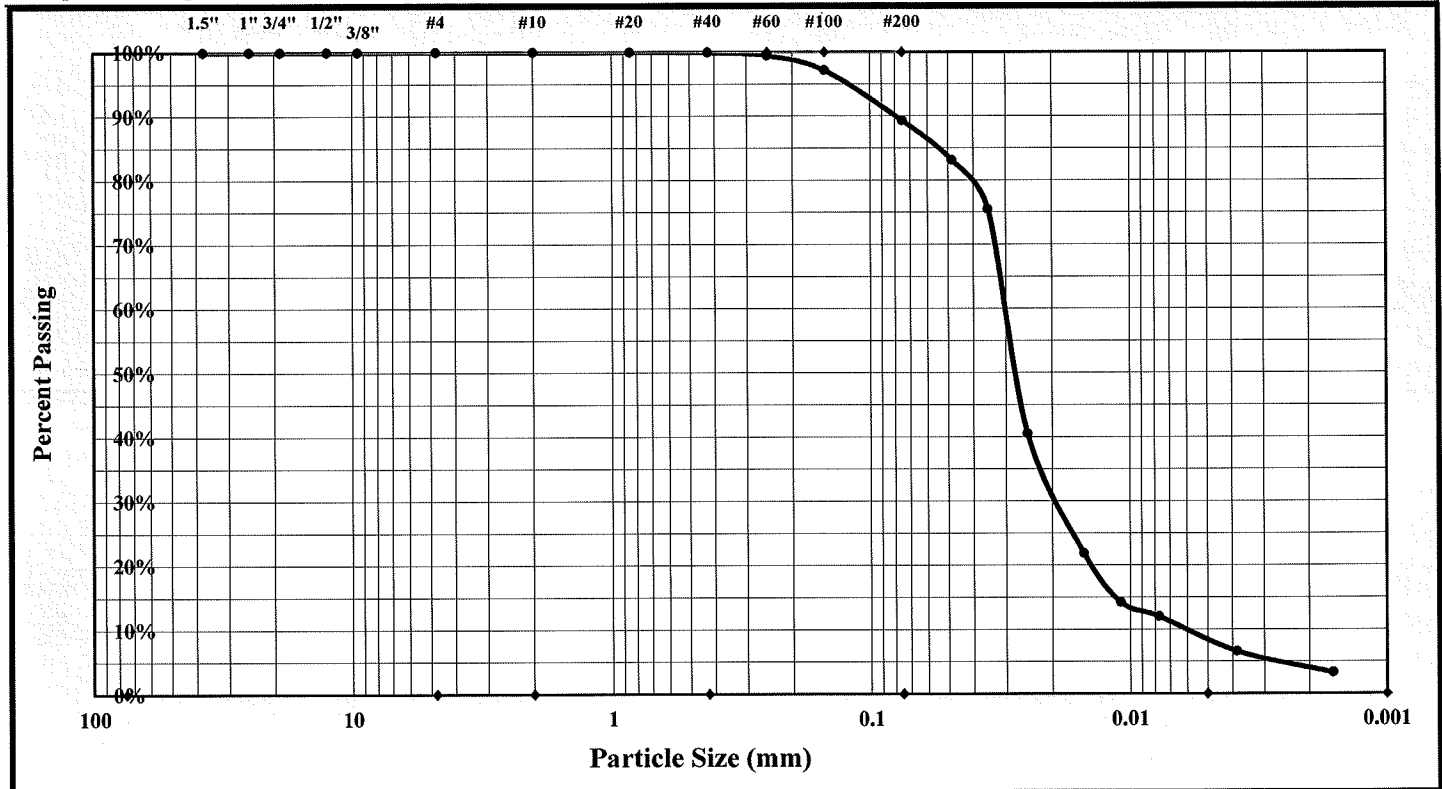


ASTM D422

Quality Assurance

S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273

S&ME Project #:	1356-11-032 Phase 03	Report Date:	9/7/12
Project Name:	Marshall Industrial Landfill No.1 Cells - 3 & 4	Test Date(s):	8/30-9/7/12
Client Name:	Duke Energy		
Address:	526 South Church Street, Charlotte, NC 28202		
Boring #:	NA	Sample #:	SG-6
		Sample Date:	8/1/12
Location:	Grid D3	Offset:	NA
		Elevation:	NA
Sample Description:	Gray Black Silt (ML)		Fly Ash



Moisture - Density Relationship



ASTM D558, D698, D1557, AASHTO T99, T180

Quality Assurance

S&ME, Inc.~ 9751 Southern Pine Boulevard~Charlotte, NC 28273

Project #:	1356-11-032	Phase 03	Report Date:	9/7/12
Project Name:	Marshall Industrial Landfill No. 1 - Cells 3 & 4		Test Date(s)	9/5-7/12
Client Name:	Duke Energy			
Client Address:	526 South Church Street, Charlotte, NC 28202			
Boring #:	NI	Sample #:	SG-6	Sample Date:
Location:	Grid D3	Offset:	NI	Depth:
Sample Description:	Black Gray Silt (ML)		Fly Ash	
Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #
Balance (0.1 g)	22182	6/8/2012	Compaction Mold	20231
Balance	22182	6/8/2012	Compaction Hammer	20222
Straightedge	20179	8/7/2012	Oven	11072
Sieve	22100	4/3/2012		

Water Content		Water Content requires GP 2 Balance (0.1 gram Readability).					Check:
ASTM D2216 <input checked="" type="checkbox"/>		AASHTO T265 <input type="checkbox"/>		ASTM D4959 <input type="checkbox"/>		ASTM D4643 <input type="checkbox"/>	
Water Added:		450	500	400	350	300	
Tare #:		51	6910	698	5C	JC	
A. Tare Weight	A.	162.4	155.6	154.6	156.1	164.0	
B. Wet Wt + Tare Wt	B.	1009.8	921.0	1023.9	1035.0	1008.8	
C. Dry Wt. + Tare Wt.	C.	805.3	724.3	826.7	848.8	843.0	
D. Water Weight	B-C	204.5	196.7	197.2	186.2	165.8	
E. Dry Weight	C-A	642.9	568.7	672.1	692.7	679.0	
F. Moisture Content	100*D/E	31.8%	34.6%	29.3%	26.9%	24.4%	
Compaction Data		Requires a GP 5 Balance for ASTM (1 gram or .0022 Lb. readability).					Check:
ASTM D558 <input type="checkbox"/>		ASTM D 698 <input checked="" type="checkbox"/>		ASTM D1557 <input type="checkbox"/>		AASHTO T99 <input type="checkbox"/>	
Method A <input checked="" type="checkbox"/>		Method B <input type="checkbox"/>		Method C <input type="checkbox"/>		Method D (ASTM 1978) <input type="checkbox"/>	
AASHTO T180 <input type="checkbox"/>		AASHTO Method D <input type="checkbox"/>					
G. Wt of Soil + Mold	G.	5698	5670	5690	5637	5588	
H. Wt. of Mold	H.	4240	4240	4240	4240	4240	
I. Wt. of Soil (g. or lbs.)	G-H	1458	1430	1450	1397	1348	
J. Wt of Soil (Lbs.)	I/453.6 or I	3.214	3.153	3.197	3.080	2.972	
K. Mold Volume Factor	K.	30.09	30.09	30.09	30.09	30.09	
L. Wet Density (PCF)	J*K	96.7	94.9	96.2	92.7	89.4	
M. Dry Density (PCF)	L/(1+F)	73.4	70.5	74.4	73.0	71.9	
Sieve Size used to separate the Oversize Fraction:		#4 Sieve <input checked="" type="checkbox"/>		3/8 inch Sieve <input type="checkbox"/>		3/4 inch Sieve <input type="checkbox"/>	
Mechanical Rammer <input checked="" type="checkbox"/>		Manual Rammer <input type="checkbox"/>		Moist Preparation <input type="checkbox"/>		Dry Preparation <input checked="" type="checkbox"/>	

References / Comments / Deviations: NI = Information not provided. ND = Not determined.

Jennifer Olsen

Technician Name

Signature

NICET / 117926

Certification Type/No.

9/7/2012

Date

Kyle Baucom

Technical Responsibility

Signature

Position

Date

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Moisture - Density Report



Quality Assurance

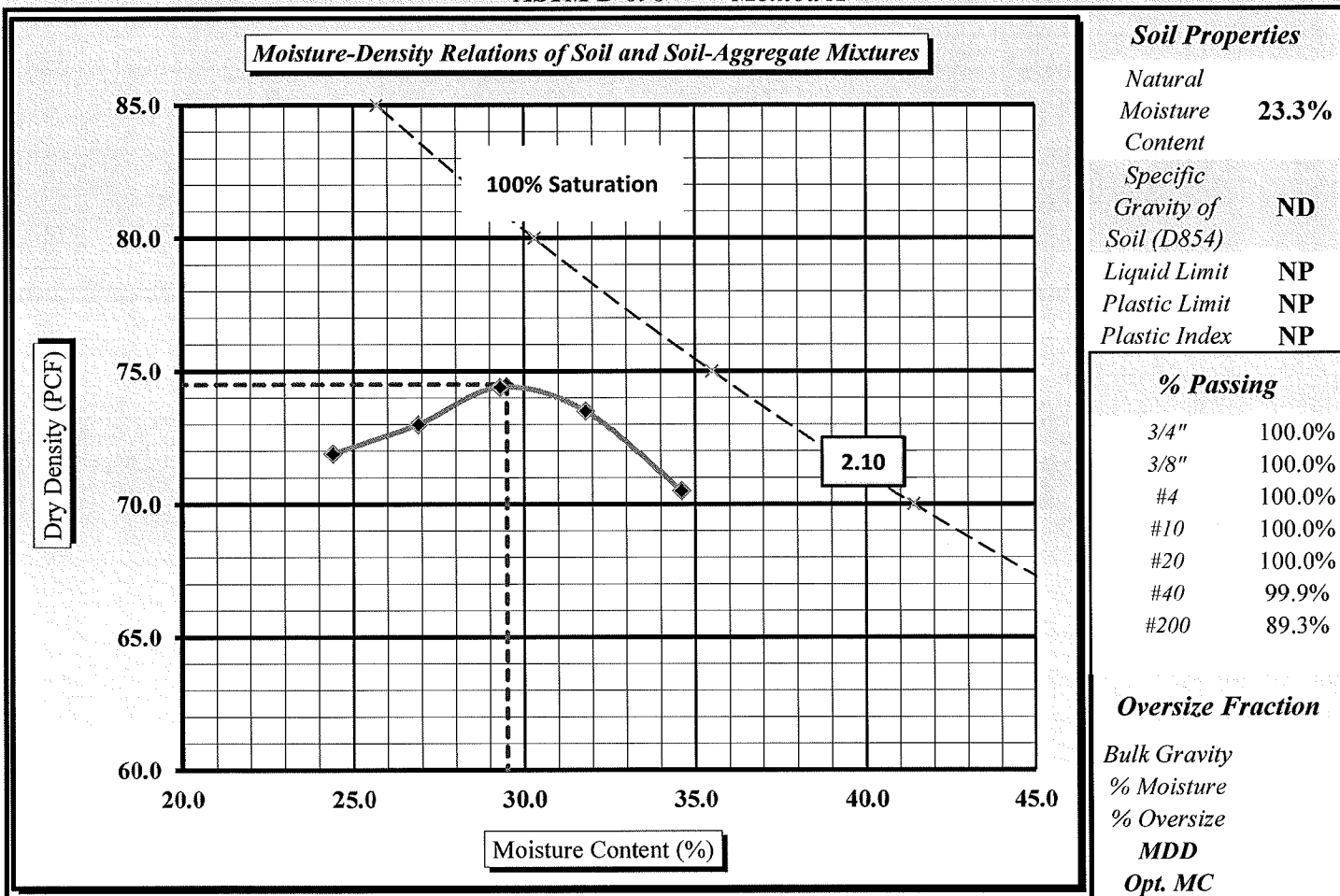
S&ME, Inc.~ 9751 Southern Pine Boulevard~Charlotte, NC 28273

S&ME Project #:	1356-11-032	Phase 03	Report Date:	9/7/12	
Project Name:	Marshall Industrial Landfill No. 1 - Cells 3 & 4		Test Date(s):	9/5-7/12	
Client Name:	Duke Energy				
Client Address:	526 South Church Street, Charlotte, NC 28202				
Boring #:	NI	Sample #:	SG-6	Sample Date:	8/15/2012
Location:	Grid D3	Offset:	NI	Depth:	NI
Sample Description:	Black Gray Silt (ML)		Fly Ash		

Maximum Dry Density 74.5 PCF.

Optimum Moisture Content 29.5%

ASTM D 698 -- Method A



Moisture-Density Curve Displayed: Fine Fraction ☒ Corrected for Oversize Fraction (ASTM D 4718) ☐
 Sieve Size used to separate the Oversize Fraction: #4 Sieve ☒ 3/8 inch Sieve ☐ 3/4 inch Sieve ☐
 Mechanical Rammer ☒ Manual Rammer ☐ Moist Preparation ☐ Dry Preparation ☒
 References / Comments / Deviations: NI = Information not provided. ND = Not determined.

Technician Name: Jennifer Olsen

Date: 9/7/12

Kyle Baucom
Technical Responsibility

Signature

Project Engineer
Position

9/7/12
Date

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Particle Size Analysis of Soils

ASTM D 422



S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273

Report Date: 9/17/12

Project #: 1356-11-032 Phase 03

Project Name:	Marshall Industrial Landfill No.1 - Cells 3&4	Test Date(s):	9/11-17/12
Client Name:	Duke Energy	Address:	526 South Church Street, Charlotte, NC 28202
Boring #:	NA	Sample #:	SG-7
Location:	Grid C1	Offset:	Fly Ash
Sample Description:	Gray Black Silt (ML)	Sample Date:	9/7/12
		Elevation:	NA
Pan #:	Beaker #:	Apparent Relative Density (Assumed)	2.200
Hydrometer Jar #:			
Pan Tare Weight (grams):		Moisture Content	Hygroscopic
Total Sample Air Dried Wt. + tare wt. (grams):	279.72	Tare #	39
Weight of Total Sample Air Dried:	279.72	Tare Wt.	13.96
Weight of Air Dried Hydrometer Sample (g):	50.04	Wet Wt. + A	24.30
Total Sample Oven Dried:	269.44	Dry Wt. + A	23.92
Hydrometer Sample Oven Dried (W):	48.20	Water Wt. (B-C)	0.38
% Passing #10:	100.0%	Dry Wt. (C-A)	9.96
Correction Factor a (Table 1):	1.09	% Moisture (100 x D/E)	3.82%

Description of Sand & Gravel Particles ☒ Rounded ☐ Angular ☒ Hard & Durable ☒ Soft ☐ Weathered & Friable ☐

Stirring Apparatus: A ☒ B ☐ Dispersion Time: 1 min. Sodium Hexametaphosphate: 40 g./ Liter

Balance: ID No. 3222 Cal. Date: 6/25/2012 Hydrometer: ID No. 3901 Cal. Date: 3/25/2012

Control Cylinder ☒ Composite Correction ☐ Type: 151H ☐ 152H ☒

Control Cylinder		Temp. (0.5 °C)	Composite Correction		Corrections		Hydrometer		Percent Passing		Effective Depth		Table 3		Diameter D = K x (L/T) ^{1/2}
Time			Hydrometer Reading	Control Cylinder	Composite Correction		R	P (#10) = (R x a / W) x 100	P (total) = P x % Passing #10	L	K				
T (Min.)															
1		24.0	42.0	5.0			37.00	83.7%	83.7%			10.2	0.01526		0.04879
2		24.0	38.0	5.0			33.00	74.6%	74.6%			10.9	0.01526		0.03559
5		24.0	30.0	5.0			25.00	56.5%	56.5%			12.2	0.01526		0.02383
15		24.0	19.0	5.0			14.00	31.7%	31.7%			14.0	0.01526		0.01474
30		24.0	15.0	5.0			10.00	22.6%	22.6%			14.7	0.01526		0.01066
60		24.0	12.0	5.0			7.00	15.8%	15.8%			15.1	0.01526		0.00767
250		24.0	7.5	5.0			2.50	5.7%	5.7%			15.9	0.01526		0.00385
1440		23.0	6.0	4.5			1.50	3.4%	3.4%			16.0	0.01544		0.00163

References / Comments / Deviations ASTM D 422, D 2487, D 4318

Oven Temperature Set at 60C.

Karen Warner
Technician Name

NICET 117900
Certification #

Kyle Baucom
Technical Responsibility

Project Engineer
Position

9/17/12
Date

Particle Size Analysis of Soils

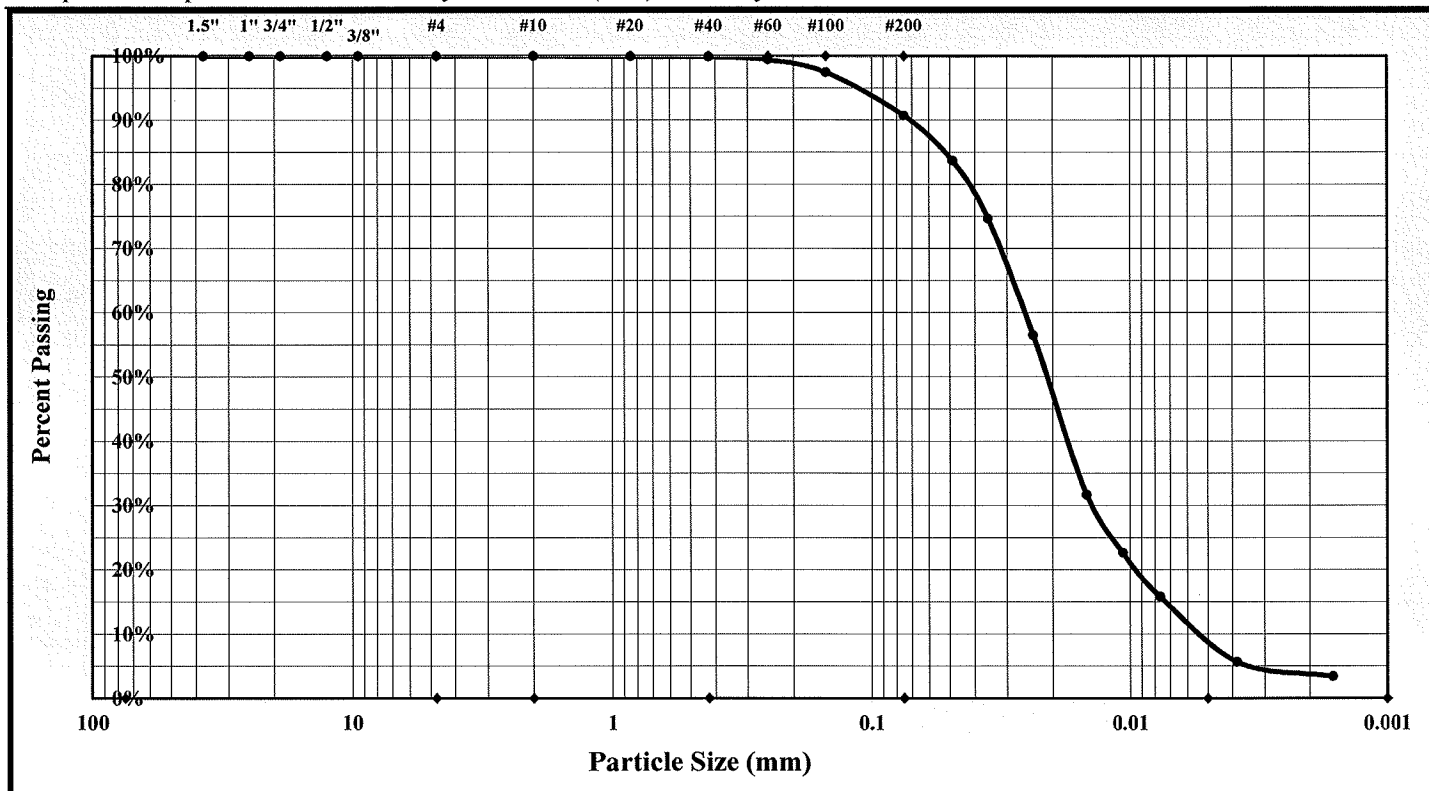


ASTM D422

Quality Assurance

S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273

S&ME Project #:	1356-11-032 Phase 03	Report Date:	9/17/12
Project Name:	Marshall Industrial Landfill No.1 - Cells 3&4	Test Date(s):	9/11-17/12
Client Name:	Duke Energy		
Address:	526 South Church Street, Charlotte, NC 28202		
Boring #:	NA	Sample #:	SG-7
		Sample Date:	9/7/12
Location:	Grid C1	Offset:	
		Elevation:	NA
Sample Description:	Gray Black Silt (ML)	Fly Ash	



Cobbles	< 300 mm (12") and > 75 mm (3")	Fine Sand	< 0.425 mm and > 0.075 mm (#200)
Gravel	< 75 mm and > 4.75 mm (#4)	Silt	< 0.075 and > 0.005 mm
Coarse Sand	< 4.75 mm and > 2.00 mm (#10)	Clay	< 0.005 mm
Medium Sand	< 2.00 mm and > 0.425 mm (#40)	Colloids	< 0.001 mm

Maximum Particle Size:	#10	Gravel:	0.0%	Silt	82.7%
Silt & Clay (% Passing #200):	90.7%	Total Sand:	9.3%	Clay	8.0%
Relative Density (Assumed)	2.200	Moisture Content	14.3%	Colloids	
Liquid Limit	NP	Plastic Limit	NP	Plastic Index	NP
Coarse Sand:	0.0%	Medium Sand:	0.1%	Fine Sand:	9.2%
Description of Sand and Gravel	Rounded <input type="checkbox"/> Angular <input checked="" type="checkbox"/>	Hard & Durable <input checked="" type="checkbox"/> Soft <input type="checkbox"/>	Weathered & Friable <input type="checkbox"/>		
Mechanical Stirring Apparatus A	Dispersion Period:	1 min.	Dispersing Agent:	Sodium Hexametaphosphate:	40 g./ Liter

References / Comments / Deviations: ASTM D 4318, D 854, D 2487

Technician Name: Kyle Baucom Date: 9/17/12

Kyle Baucom
Technical Responsibility

Kyle Baucom
Signature

Project Engineer
Position

9/17/12
Date

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Liquid Limit, Plastic Limit, and Plastic Index



Another code

ASTM D 4318



AASHTO T 89



AASHTO T 90



Quality Assurance

S&ME, Inc. ~9751 Southern Pine Boulevard, Charlotte, NC 28273

Project #: 1356-11-032 Phase 03

Report Date: 9/17/12

Project Name: Marshall Industrial Landfill No.1 Cells 3 & 4

Test Date(s) 9/11-17/12

Client Name: Duke Energy

Client Address: 526 South Church Street, Charlotte, NC 28202

Boring #: NA

Sample #: SG-7

Sample Date: 9/7/12

Location: Grid C1

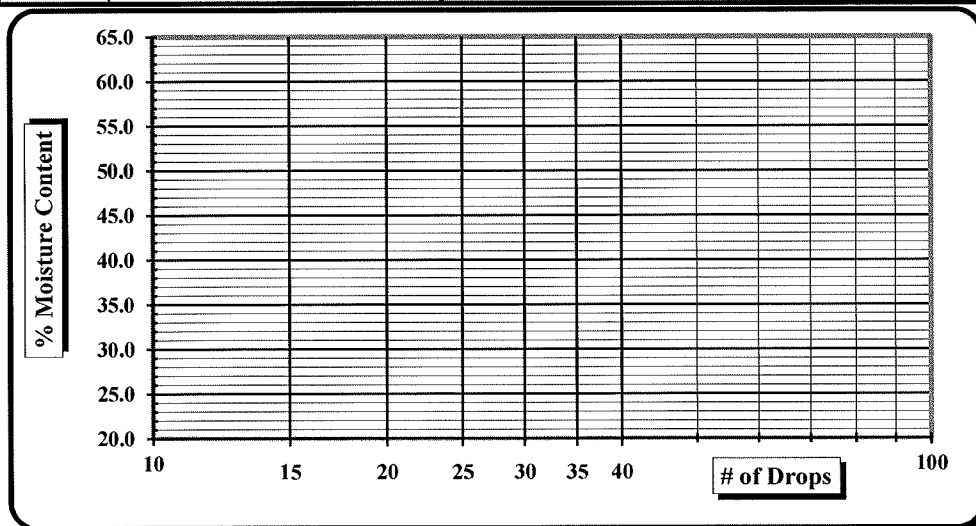
Offset: NA

Elevation: NA

Sample Description: Black Gray Silt (ML) Fly Ash

Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #	Cal Date:
Balance (0.01 g)	3222	6/25/2012	Grooving tool	20165	12/20/2011
LL Apparatus	20230	6/26/2012	Grooving tool		
Oven	10844	5/9/2012	Grooving tool		

Pan #	Tare #:	Liquid Limit						Plastic Limit		
A	Tare Weight									
B	Wet Soil Weight + A									
C	Dry Soil Weight + A									
D	Water Weight (B-C)									
E	Dry Soil Weight (C-A)									
F	% Moisture (D/E)*100									
N	# OF DROPS							Moisture Contents determined by ASTM D 2216		
LL	LL = F * FACTOR									
Ave.	Average									



One Point Liquid Limit			
N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic ☒

Liquid Limit

Plastic Limit

Plastic Index

Group Symbol ML

Multipoint Method ☒One-point Method ☐Wet Preparation ☐Dry Preparation ☒Air Dried ☒

Estimate the % Retained on the #40 Sieve:

Notes / Deviations / References:

ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils

Karen Warner
Technician Name9/17/12
DateKyle Baucom
Technical Responsibility9/17/12
Date

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Moisture - Density Report



Quality Assurance

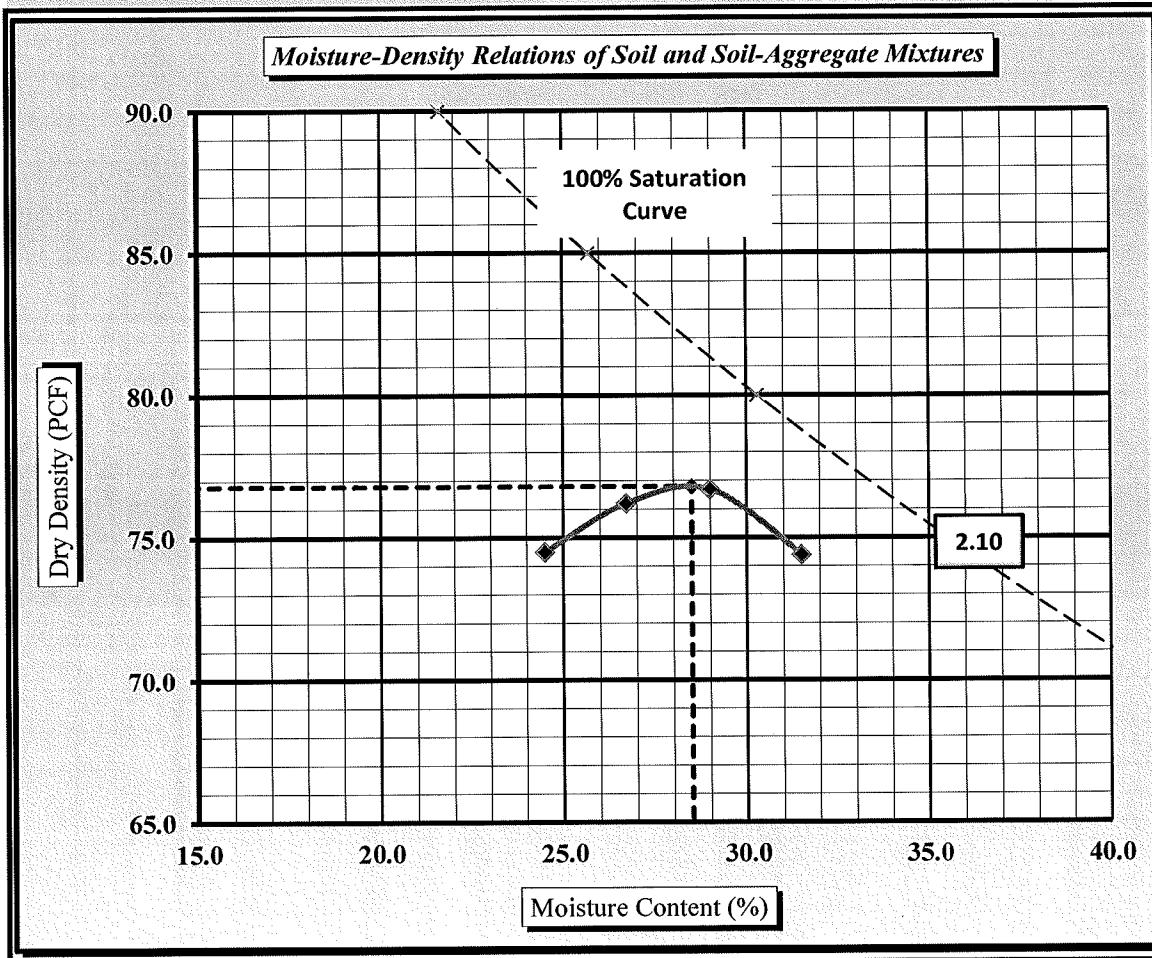
S&ME, Inc.~ 9751 Southern Pine Boulevard~Charlotte, NC 28273

S&ME Project #:	1356-11-032	Phase 03		Report Date:	9/24/12
Project Name:	Marshall Industrial Landfill No. 1 - Cells 3 & 4			Test Date(s):	9/21-24/12
Client Name:	Duke Energy				
Client Address:	526 South Church Street, Charlotte, NC 28202				
Boring #:	NI	Sample #:	SG-7	Sample Date:	9/7/2012
Location:	Grid C1	Offset:	NI	Depth:	NI
Sample Description:	Gray Black Silt (ML) Fly Ash				

Maximum Dry Density 76.8 PCF.

Optimum Moisture Content 28.5%

ASTM D 698 -- Method A



Soil Properties

Natural Moisture Content	14.3%
Specific Gravity of Soil (D854)	ND
Liquid Limit	NP
Plastic Limit	NP
Plastic Index	NP

% Passing

3/4"	100.0%
3/8"	100.0%
#4	100.0%
#10	100.0%
#20	99.9%
#40	99.9%
#200	90.7%

Oversize Fraction

Bulk Gravity
% Moisture
% Oversize
MDD
Opt. MC

Moisture-Density Curve Displayed: Fine Fraction ☒ Corrected for Oversize Fraction (ASTM D 4718) ☐
 Sieve Size used to separate the Oversize Fraction: #4 Sieve ☒ 3/8 inch Sieve ☐ 3/4 inch Sieve ☐
 Mechanical Rammer ☒ Manual Rammer ☐ Moist Preparation ☐ Dry Preparation ☒

References / Comments / Deviations: NI = Information not provided. ND = Not determined.

Technician Name: Jennifer Olsen

Date: 9/24/12

Kyle Baucom
Technical Responsibility

Kyle Baucom
Signature

Project Engineer
Position

9/24/12
Date

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Moisture - Density Relationship



ASTM D558, D698, D1557, AASHTO T99, T180

Quality Assurance

S&ME, Inc.~ 9751 Southern Pine Boulevard~Charlotte, NC 28273

Project #:	1356-11-032	Phase 03	Report Date:	9/24/12
Project Name:	Marshall Industrial Landfill No. 1 - Cells 3 & 4		Test Date(s)	9/21-24/12
Client Name:	Duke Energy			
Client Address:	526 South Church Street, Charlotte, NC 28202			
Boring #:	NI	Sample #:	SG-7	Sample Date:
Location:	Grid C1	Offset:	NI	Depth:
Sample Description:	Gray Black Silt (ML) Fly Ash			

Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #	Cal Date:
Balance (0.1 g)	22182	6/8/2012	Compaction Mold	20231	1/6/2012
Balance	22182	6/8/2012	Compaction Hammer	20222	6/6/2012
Straightedge	20179	8/7/2012	Oven	11072	7/13/2012
Sieve	22100	4/3/2012			

Water Content		Water Content requires GP 2 Balance (0.1 gram Readability).				Check:	
ASTM D2216 <input checked="" type="checkbox"/>		AASHTO T265 <input type="checkbox"/>		ASTM D4959 <input type="checkbox"/>		ASTM D4643 <input type="checkbox"/>	
Water Added:		500	550	600	450	Natural	
Tare #:		DMJ	691	99	5L		
A. Tare Weight	A.	164.2	156.5	158.2	155.3		
B. Wet Wt + Tare Wt	B.	1021.4	1006.9	982.1	1024.8		
C. Dry Wt. + Tare Wt.	C.	840.8	815.9	784.8	853.6		
D. Water Weight	B-C	180.6	191.0	197.3	171.2		
E. Dry Weight	C-A	676.6	659.4	626.6	698.3		
F. Moisture Content	100*D/E	26.7%	29.0%	31.5%	24.5%		

Compaction Data		Requires a GP 5 Balance for ASTM (1 gram or .0022 Lb. readability).				Check:	
ASTM D558 <input type="checkbox"/>		ASTM D 698 <input checked="" type="checkbox"/>		ASTM D1557 <input type="checkbox"/>		AASHTO T99 <input type="checkbox"/>	
Method A <input checked="" type="checkbox"/>		Method B <input type="checkbox"/>		Method C <input type="checkbox"/>		Method D (ASTM 1978) <input type="checkbox"/>	
						AASHTO T180 <input type="checkbox"/>	
						AASHTO Method D <input type="checkbox"/>	
G. Wt of Soil + Mold	G.	5696	5732	5715	5637		
H. Wt. of Mold	H.	4239	4239	4239	4239		
I. Wt. of Soil (g. or lbs.)	G-H	1457	1493	1476	1398		
J. Wt of Soil (Lbs.)	I/453.6 or I	3.212	3.291	3.254	3.082		
K. Mold Volume Factor	K.	30.09	30.09	30.09	30.09		
L. Wet Density (PCF)	J*K	96.6	99.0	97.9	92.7		
M. Dry Density (PCF)	L/(1+F)	76.2	76.7	74.4	74.5		
Sieve Size used to separate the Oversize Fraction:		#4 Sieve <input checked="" type="checkbox"/>		3/8 inch Sieve <input type="checkbox"/>		3/4 inch Sieve <input type="checkbox"/>	
Mechanical Rammer <input checked="" type="checkbox"/>		Manual Rammer <input type="checkbox"/>		Moist Preparation <input type="checkbox"/>		Dry Preparation <input checked="" type="checkbox"/>	

References / Comments / Deviations: NI = Information not provided. ND = Not determined.

Jennifer Olsen

Technician Name

Signature

NICET / 117926

Certification Type/No.

9/24/2012

Date

 Kyle Baucom
 Technical Responsibility

Signature

Position

Date

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Laboratory Determination of Water Content



ASTM D 2216



AASHTO T 265



Quality Assurance

S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273

Project #: 1356-11-032 Phase 03

Report Date: 9/17/12

Project Name: Marshall Industrial Landfill No.1 Cells 3 & 4

Test Date(s): 9/14-17/12

Client Name: Duke Energy

Client Address: 526 South Church Street, Charlotte, NC 28202

Sample by: Kyle Baucom

Sample Date(s): 9/13/12

Sampling Method:	NA
------------------	----

Drill Rig : NA

Method: A (1%)



B (0.1%)



Balance ID. 3222

Calibration Date: 6/25/12

[illegible]

Notes / Deviations / References

Oven Temperature Set at 60C.

ASTM D 2216: Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass

Karen Warner
Technician Name

Signature

NICET 117900
Certification Type / No.

9/17/12
Date

Kyle Baucom
Technical Responsibility

Kyl Turner
Signature

Project Engineer
Position

9/17/12
Date

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Particle Size Analysis of Soils



ASTM D 422

S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273

Project #: 1356-11-032 Phase 03 Report Date: 9/21/12

Project Name: Marshall Industrial Landfill No.1 - Cells 3&4 Test Date(s): 9/14-21/12

Client Name: Duke Energy Address: 526 South Church Street, Charlotte, NC 28202

Boring #: NA Sample #: SG-8 Sample Date: 9/13/12

Location: Grid C1 Offset: Elevation: NA

Sample Description: Gray Black Silt (ML) Fly Ash

Pan #: Beaker #: Apparent Relative Density (Assumed) 2.200

Hydrometer Jar #: Moisture Content Hygroscopic Natural

Pan Tare Weight (grams): Tare # 7

Total Sample Air Dried Wt. + tare wt. (grams): 332.58

Weight of Total Sample Air Dried: 332.58

Weight of Air Dried Hydrometer Sample (g): 50.00

Total Sample Oven Dried: 331.38

Hydrometer Sample Oven Dried (W): 49.82

% Passing #10: 100.0%

Correction Factor a (Table 1): 1.09

Description of Sand & Gravel Particles Rounded ☐ Angular ☒ Hard & Durable ☒ Soft ☐ Weathered & Friable ☐Stirring Apparatus: A ☒ B ☐ Dispersion Time: 1 min. Sodium Hexametaphosphate: 40 g./ Liter

Balance: ID No. 3222 Cal Date: 6/25/2012 Hydrometer: ID No. 3901 Cal Date: 3/25/2012

Control Cylinder ☒ Composite Correction ☐ Type: 15H ☐ 152H ☒

Time	Temp.	Hydrometer Reading	Control Cylinder	Composite Correction	Hydrometer R	Percent Passing	Effective Depth	Table 3	Diameter
T (Min.)	(0.5 °C)					P(=10) = (R x a / W) x 100	L	K	D = K x (L/T) ^{1/2}
1	23.5	43.0	4.5		38.50	84.2%	10.0	0.01535	0.04849
2	23.5	38.0	4.5		33.50	73.3%	10.8	0.01535	0.03567
5	23.5	22.0	4.5		17.50	38.3%	13.4	0.01535	0.02515
15	23.5	12.5	4.5		8.00	17.5%	15.0	0.01535	0.01534
30	24.0	11.0	4.5		6.50	14.2%	15.2	0.01526	0.01087
60	24.0	8.0	4.5		3.50	7.7%	15.7	0.01526	0.00781
250	24.0	6.5	4.5		2.00	4.4%	16.0	0.01526	0.00386
1440	23.5	5.0	4.5		0.50	1.1%	16.2	0.01535	0.00163

References / Comments / Deviations ASTM D 422, D 2487, D 4318

Oven Temperature Set at 60C.

Karen Warner
Technician NameNICET 117900
Certification #Kyle Baucom
Technical ResponsibilityProject Engineer
Position7/21/12
Date

Particle Size Analysis of Soils



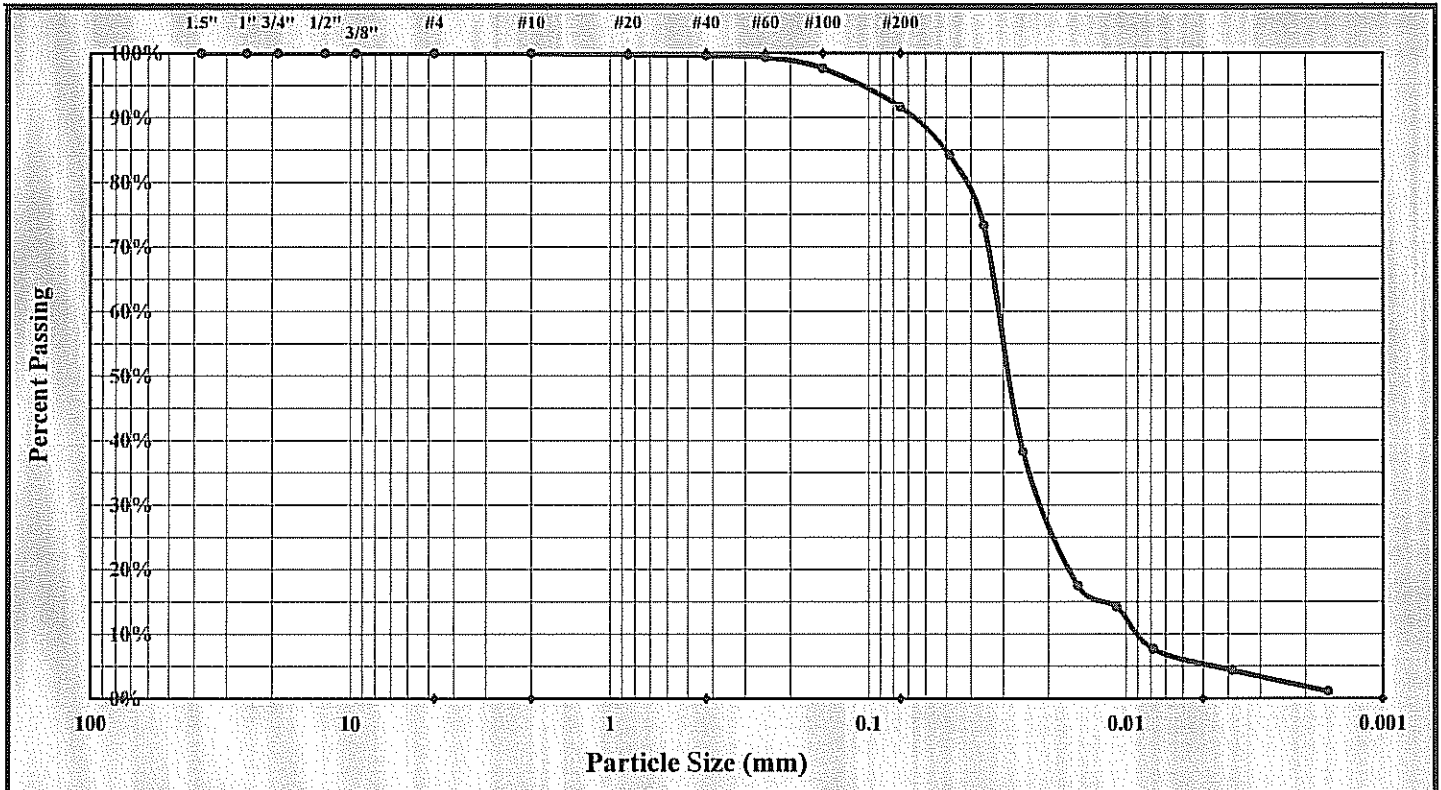
ASTM D422

Quality Assurance

S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273

S&ME Project #:	1356-11-032 Phase 03	Report Date:	9/21/12
Project Name:	Marshall Industrial Landfill No.1 - Cells 3&4	Test Date(s):	9/14-21/12
Client Name:	Duke Energy		
Address:	526 South Church Street, Charlotte, NC 28202		
Boring #:	NA	Sample #:	SG-8
Location:	Grid C1	Offset:	Elevation:
			NA

Sample Description: Gray Black Silt (ML) Fly Ash



Cobbles	< 300 mm (12\") and > 75 mm (3\")	Fine Sand	< 0.425 mm and > 0.075 mm (#200)
Gravel	< 75 mm and > 4.75 mm (#4)	Silt	< 0.075 and > 0.005 mm
Coarse Sand	< 4.75 mm and > 2.00 mm (#10)	Clay	< 0.005 mm
Medium Sand	< 2.00 mm and > 0.425 mm (#40)	Colloids	< 0.001 mm

Maximum Particle Size:	#10	Gravel:	0.0%	Silt	86.7%
Silt & Clay (% Passing #200):	91.7%	Total Sand:	8.3%	Clay	5.0%
Unit Relative Density (Assumed)	2.200	Moisture Content	20.9%	Colloids	
Liquid Limit	NP	Plastic Limit	NP	Plastic Index	NP
Coarse Sand:	0.0%	Medium Sand:	0.4%	Fine Sand:	8.0%

Description of Sand and Gravel: Rounded ☐ Angular ☒ Hard & Durable ☒ Soft ☐ Weathered & Friable ☐

Mechanical Stirring Apparatus A Dispersion Period: 1 min. Dispersing Agent: Sodium Hexametaphosphate: 40 g./ Liter

References / Comments / Deviations: ASTM D 4318, D 854, D 2487 Oven Temperature Set at 60C.

Technician Name: Kyle Baucom Date: 9/21/12

Kyle Baucom
Technical Responsibility

[Signature]
Signature

Project Engineer
Position

9/21/12
Date

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Liquid Limit, Plastic Limit, and Plastic Index



Another code

ASTM D 4318 ☒AASHTO T 89 ☐AASHTO T 90 ☐

Quality Assurance

S&ME, Inc. ~9751 Southern Pine Boulevard, Charlotte, NC 28273

Project #: 1356-11-032 Phase 03

Report Date: 9/21/12

Project Name: Marshall Industrial Landfill No.1 Cells 3 & 4

Test Date(s) 9/14-21/12

Client Name: Duke Energy

Client Address: 526 South Church Street, Charlotte, NC 28202

Boring #: NA

Sample #: SG-8

Sample Date: 9/13/12

Location: Grid C1

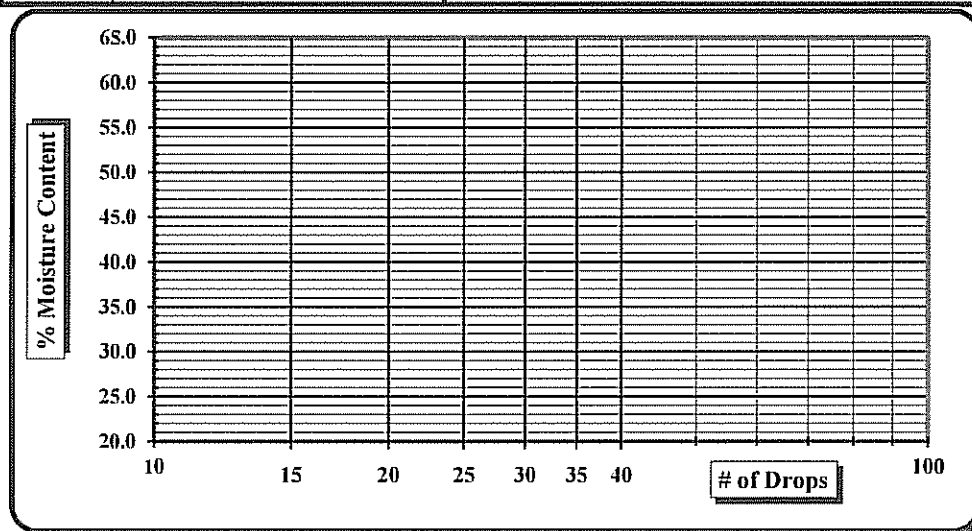
Offset: NA

Elevation: NA

Sample Description: Black Gray Silt (ML) Fly Ash

Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #	Cal Date:
Balance (0.01 g)	3222	6/25/2012	Grooving tool	20165	12/20/2011
LL Apparatus	20230	6/26/2012	Grooving tool		
Oven	10844	9/9/2012	Grooving tool		

Pan #	Tare #:	Liquid Limit					Plastic Limit		
A	Tare Weight								
B	Wet Soil Weight + A								
C	Dry Soil Weight + A								
D	Water Weight (B-C)								
E	Dry Soil Weight (C-A)								
F	% Moisture (D/E)*100								
N	# OF DROPS						Moisture Contents determined by ASTM D 2216		
LL	LL = F * FACTOR								
Ave.	Average								



One Point Liquid Limit			
N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic ☒

Liquid Limit

Plastic Limit

Plastic Index

Group Symbol ML

Multipoint Method ☒One-point Method ☐Wet Preparation ☐ Dry Preparation ☒ Air Dried ☒

Estimate the % Retained on the #40 Sieve:

Notes / Deviations / References:

Oven Temperature Set at 60C.

ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils

Karen Warner

Technician Name

9/21/12

Date

Kyle Baucom

Technical Responsibility

9/21/12

Date

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Moisture - Density Report



Quality Assurance

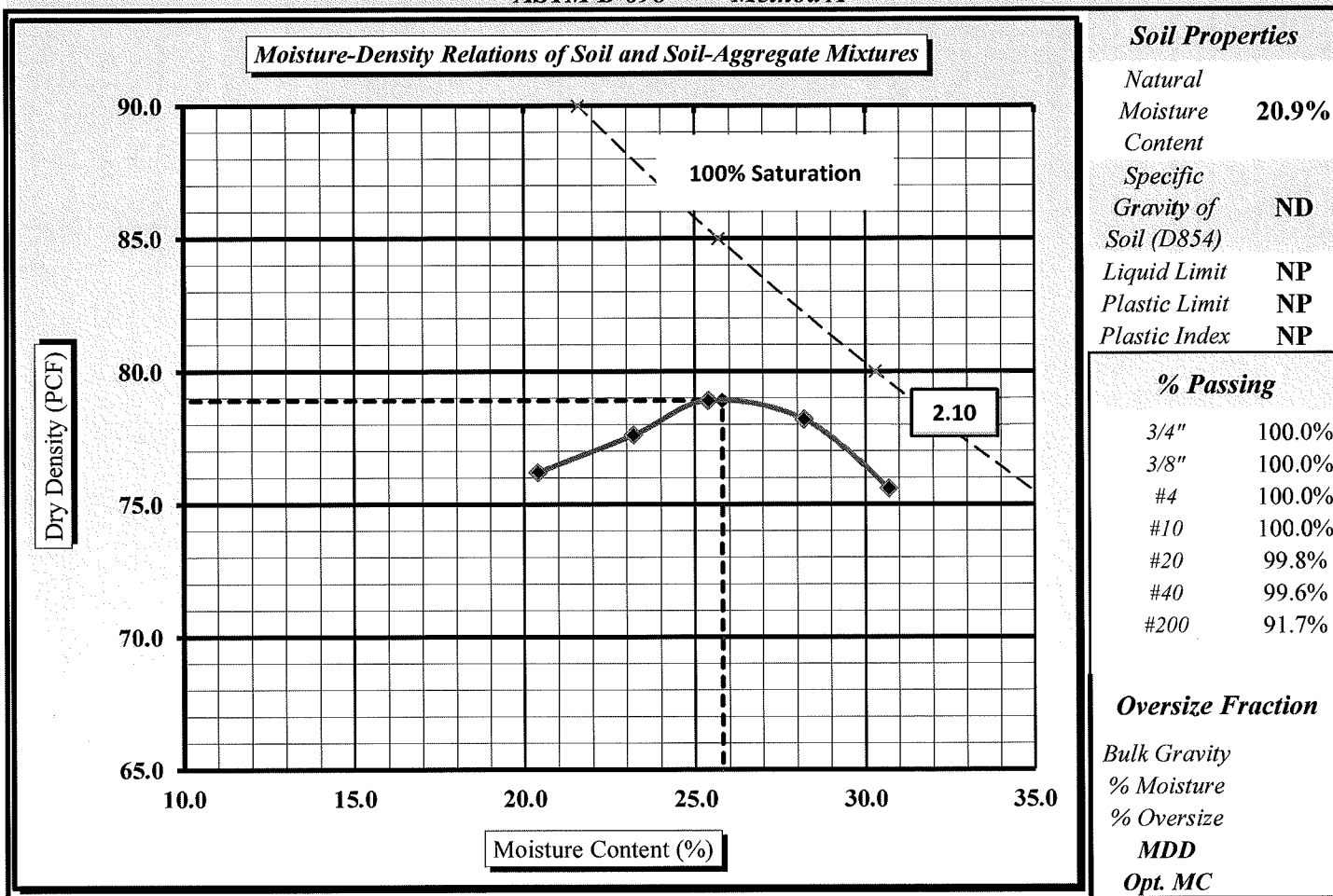
S&ME, Inc.~ 9751 Southern Pine Boulevard~Charlotte, NC 28273

S&ME Project #:	1356-11-032	Phase 03	Report Date:	10/10/12	
Project Name:	Marshall Industrial Landfill No. 1 - Cells 3 & 4		Test Date(s):	10/4-10/12	
Client Name:	Duke Energy				
Client Address:	526 South Church Street, Charlotte, NC 28202				
Boring #:	NI	Sample #:	SG-8	Sample Date:	9/13/2012
Location:	Grid C1	Offset:	NI	Depth:	NI
Sample Description:	Gray Black Silt (ML)				

Maximum Dry Density 78.9 PCF.

Optimum Moisture Content 25.8%

ASTM D 698 -- Method A



Moisture-Density Curve Displayed: Fine Fraction ☒ Corrected for Oversize Fraction (ASTM D 4718) ☐
 Sieve Size used to separate the Oversize Fraction: #4 Sieve ☒ 3/8 inch Sieve ☐ 3/4 inch Sieve ☐
 Mechanical Rammer ☒ Manual Rammer ☐ Moist Preparation ☐ Dry Preparation ☒

References / Comments / Deviations: NI = Information not provided. ND = Not determined.

Technician Name: Jennifer Olsen

Date: 10/10/12

Kyle Baucom
Technical Responsibility

Signature

Project Engineer
Position

10/16/12
Date

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Moisture - Density Relationship



ASTM D558, D698, D1557, AASHTO T99, T180

Quality Assurance

S&ME, Inc.~ 9751 Southern Pine Boulevard~Charlotte, NC 28273

Project #:	1356-11-032	Phase 03	Report Date:	10/10/12
Project Name:	Marshall Industrial Landfill No. 1 - Cells 3 & 4		Test Date(s)	10/4-10/12
Client Name:	Duke Energy			
Client Address:	526 South Church Street, Charlotte, NC 28202			
Boring #:	NI	Sample #:	SG-8	Sample Date:
Location:	Grid C1	Offset:	NI	Depth:
Sample Description:	Gray Black Silt (ML)			
Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #
Balance (0.1 g)	22182	6/8/2012	Compaction Mold	20231
Balance	22182	6/8/2012	Compaction Hammer	20222
Straightedge	20179	8/7/2012	Oven	22151
Sieve	22100	10/1/2012		

Water Content		Water Content requires GP 2 Balance (0.1 gram Readability).					Check:
ASTM D2216 <input checked="" type="checkbox"/>		AASHTO T265 <input type="checkbox"/>		ASTM D4959 <input type="checkbox"/>		ASTM D4643 <input type="checkbox"/>	
Water Added:		400	350	300	250	200	Natural
Tare #:		AMRL	99	6910	JC	5C	
A. Tare Weight	A.	163.7	158.8	156.4	164.5	156.8	
B. Wet Wt + Tare Wt	B.	897.8	925.9	1010.3	1077.2	973.7	
C. Dry Wt. + Tare Wt.	C.	725.4	757.2	837.1	905.3	835.1	
D. Water Weight	B-C	172.4	168.7	173.2	171.9	138.6	
E. Dry Weight	C-A	561.7	598.4	680.7	740.8	678.3	
F. Moisture Content	100*D/E	30.7%	28.2%	25.4%	23.2%	20.4%	
Compaction Data		Requires a GP 5 Balance for ASTM (1 gram or .0022 Lb. readability).					Check:
ASTM D558 <input type="checkbox"/>		ASTM D 698 <input checked="" type="checkbox"/>		ASTM D1557 <input type="checkbox"/>		AASHTO T99 <input type="checkbox"/>	
Method A <input checked="" type="checkbox"/>		Method B <input type="checkbox"/>		Method C <input type="checkbox"/>		Method D (ASTM 1978) <input type="checkbox"/>	
						AASHTO T180 <input type="checkbox"/>	
						AASHTO Method D <input type="checkbox"/>	
G. Wt of Soil + Mold	G.	5729	5749	5731	5680	5622	
H. Wt. of Mold	H.	4239	4239	4239	4239	4239	
I. Wt. of Soil (g. or lbs.)	G-H	1490	1510	1492	1441	1383	
J. Wt of Soil (Lbs.)	1/453.6 or 1	3.285	3.329	3.289	3.177	3.049	
K. Mold Volume Factor	K.	30.09	30.09	30.09	30.09	30.09	
L. Wet Density (PCF)	J*K	98.8	100.2	99.0	95.6	91.7	
M. Dry Density (PCF)	L/(1+F)	75.6	78.2	78.9	77.6	76.2	
Sieve Size used to separate the Oversize Fraction:		#4 Sieve <input checked="" type="checkbox"/>		3/8 inch Sieve <input type="checkbox"/>		3/4 inch Sieve <input type="checkbox"/>	
Mechanical Rammer <input checked="" type="checkbox"/>		Manual Rammer <input type="checkbox"/>		Moist Preparation <input type="checkbox"/>		Dry Preparation <input checked="" type="checkbox"/>	

References / Comments / Deviations: NI = Information not provided. ND = Not determined.

Jennifer Olsen

Technician Name

Signature

NICET / 117926

Certification Type/No.

10/10/2012

Date

Kyle Baucom
Technical Responsibility

Signature

Position

10/10/12
Date

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Laboratory Determination of Water Content



ASTM D 2216



AASHTO T 265



Quality Assurance

S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273

Project #: 1356-11-32 Phase 03

Report Date: 10/11/12

Project Name: Marshall Industrial Landfill No.1 - Cells 3 & 4

Test Date(s): 10/2-11/12

Client Name: Duke Energy

Client Address: 526 South Church Street, Charlotte, NC 28202

Sample by: Jimmy Addis

Sample Date(s): 9/21/12

Sampling Method:	NA
------------------	----

Drill Rig : NA

Method: A (1%)



B (0.1%)



Balance ID. 3222

Calibration Date: 6/25/12

[illegible]

Notes / Deviations / References

Location: Grid D3

Oven Temperature Set at 60C

No jar sample for moisture.

ASTM D 2216: Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass

Karen Warner

Technician Name

Signature

NICET 117900

Certification Type / No.

Date _____

Kyle Baucom
Technical Responsibility

Signature

Project Engineer
Position

Date _____

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Liquid Limit, Plastic Limit, and Plastic Index



Another code

ASTM D 4318



AASHTO T 89



AASHTO T 90



Quality Assurance

S&ME, Inc. ~9751 Southern Pine Boulevard, Charlotte, NC 28273

Project #: 1356-11-032 Phase 03

Report Date: 10/12/12

Project Name: Marshall Industrial Landfill No.1- Cells 3&4

Test Date(s) 10/2-12/12

Client Name: Duke Energy

Client Address: 526 South Church Street, Charlotte, NC 28202

Boring #: NA

Sample #: SG-9

Sample Date: 9/21/12

Location: Grid D3

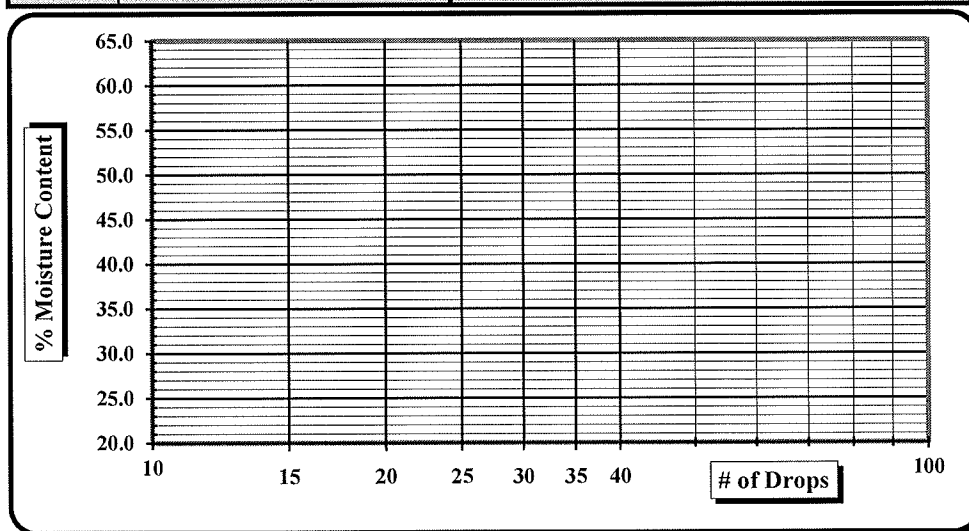
Offset: NA

Elevation: NA

Sample Description: Black Gray Silt (ML)

Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #	Cal Date:
Balance (0.01 g)	3222	6/25/2012	Grooving tool	20165	12/20/2012
LL Apparatus	20230	6/26/2012	Grooving tool		
Oven	10844	9/9/2012	Grooving tool		

Pan #	Tare #:	Liquid Limit						Plastic Limit		
A	Tare Weight									
B	Wet Soil Weight + A									
C	Dry Soil Weight + A									
D	Water Weight (B-C)									
E	Dry Soil Weight (C-A)									
F	% Moisture (D/E)*100									
N	# OF DROPS							Moisture Contents determined by ASTM D 2216		
LL	LL = F * FACTOR									
Ave.	Average									



One Point Liquid Limit			
N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic ☒

Liquid Limit

Plastic Limit

Plastic Index

Group Symbol ML

Multipoint Method ☒One-point Method ☐Wet Preparation ☐Dry Preparation ☒Air Dried ☒

Estimate the % Retained on the #40 Sieve:

Notes / Deviations / References:

ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils

Karen Warner

Technician Name

Date

Kyle Baucom

Technical Responsibility

10/16/12

Date

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Particle Size Analysis of Soils

ASTM D 422



S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273

Project #: **1356-11-032 Phase 03** Report Date: 10/15/12

Project Name: **Marshall Industrial Landfill No. 1 Cells 3 & 4** Test Date(s): 10/2-15/12

Client Name: **Duke Energy** Address: **526 South Church Street, Charlotte, NC**

Boring #: **NA** Sample #: **SG-9** Sample Date: **9/21/12**

Location: **Grid D3** Offset: **NA** Elevation: **NA**

Sample Description: **Black Gray Silt (ML)**

Pan #:	Beaker #:	Apparent Relative Density (Assumed)	2.200	Sieve	Retained Wt.	Pan #	Percent Passing
Hydrometer Jar #:				3.0"	0.0		100.0%
Pan Tare Weight (grams):				1.5"	0.0		100.0%
Total Sample Air Dried Wt. + tare wt. (grams):				1.0"	0.0		100.0%
Weight of Total Sample Air Dried:				3/4"	0.0		100.0%
Weight of Air Dried Hydrometer Sample (g):				1/2"	0.0		100.0%
Total Sample Oven Dried:				3/8"	0.0	Soil Mortar	100.0%
Hydrometer Sample Oven Dried (W):				#4	0.0		100.0%
% Passing #10:				#10	0.00	100.0%	100.0%
Correction Factor a (Table 1):				#20	0.01	100.0%	100.0%
				#40	0.07	99.8%	99.8%
				#60	0.34	99.2%	99.2%
				#100	1.32	97.1%	97.1%
				#200	4.05	91.0%	91.0%

Description of Sand & Gravel Particles: ☐ Rounded ☐ Angular ☒ Hard & Durable ☒ Soft ☐ Weathered & Friable ☐

Stirring Apparatus: ☐ A ☒ B ☐ Dispersion Time: 1 min. Sodium Hexametaphosphate: 40 g./ Liter

Balance: ID No. 3222 Cal. Date: 6/25/2012 Hydrometer: ID No. 3921 Cal. Date: 3/25/2012

Control Cylinder ☒ Composite Correction ☐ Type: 151H ☐ 152H ☒

Time	Temp. (0.5 °C)	Hydrometer Reading	Corrections		Hydrometer R	Percent Passing		Effective Depth L	Table 3		Diameter D = K x (L/T) ^{1/2}
			Control Cylinder	Composite Correction		P(-#10) = (R x a / W) x 100	P (total) = P x % Passing #10		L	K	
2	23.5	39.0	5.0		34.00	82.4%	82.4%	10.7	0.01535	0.01535	0.03553
5	23.5	28.5	5.0		23.50	57.0%	57.0%	12.4	0.01535	0.01535	0.02421
15	23.5	19.5	5.0		14.50	35.2%	35.2%	13.9	0.01535	0.01535	0.01478
30	23.5	15.0	5.0		10.00	24.2%	24.2%	14.7	0.01535	0.01535	0.01073
60	23.5	12.5	5.0		7.50	18.2%	18.2%	15.1	0.01535	0.01535	0.00769
250	23.5	8.5	5.0		3.50	8.5%	8.5%	15.7	0.01535	0.01535	0.00385
1440	22.5	6.0	4.5		1.50	3.6%	3.6%	16.0	0.01553	0.01553	0.00164
					#VALUE!	#VALUE!	#VALUE!	#VALUE!	#N/A	#N/A	#N/A

References / Comments / Deviations ASTM D 422, D 2487, D 4318

Oven Temperature Set at 60C.

Karen Warner
Technician NameNICET 117900
Certification #Kyle Baucom
Technical ResponsibilityProject Engineer
Position10/15/12
Date

Particle Size Analysis of Soils



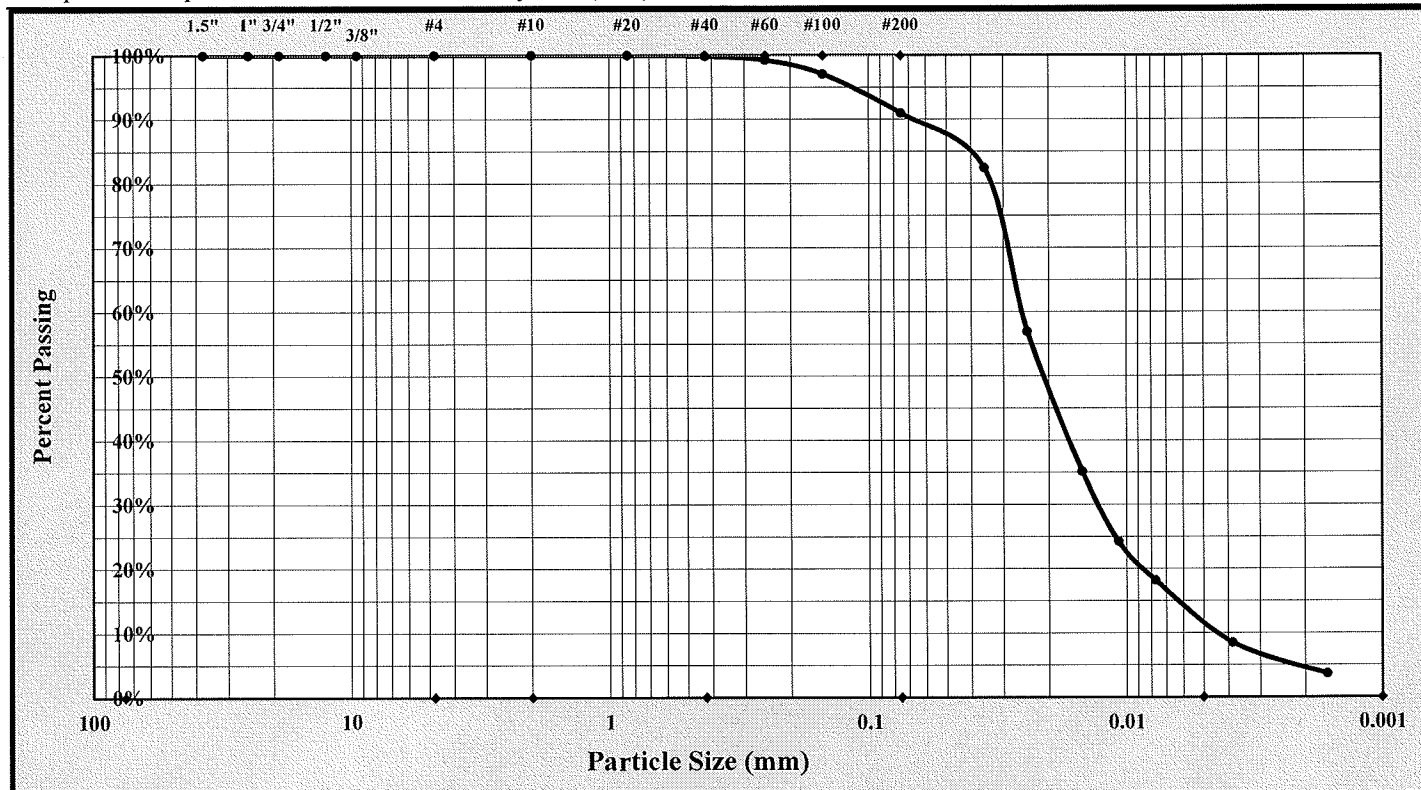
ASTM D422

Quality Assurance

S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273

S&ME Project #:	1356-11-032 Phase 03	Report Date:	10/15/12
Project Name:	Marshall Industrial Landfill No. 1 Cells 3 & 4	Test Date(s):	10/2-15/12
Client Name:	Duke Energy		
Address:	526 South Church Street, Charlotte, NC		
Boring #:	NA	Sample #: SG-9	Sample Date: 9/21/12
Location:	Grid D3	Offset: NA	Elevation: NA

Sample Description: Black Gray Silt (ML)



Cobbles	< 300 mm (12") and > 75 mm (3")	Fine Sand	< 0.425 mm and > 0.075 mm (#200)
Gravel	< 75 mm and > 4.75 mm (#4)	Silt	< 0.075 and > 0.005 mm
Coarse Sand	< 4.75 mm and > 2.00 mm (#10)	Clay	< 0.005 mm
Medium Sand	< 2.00 mm and > 0.425 mm (#40)	Colloids	< 0.001 mm

Maximum Particle Size:	#20	Gravel:	0.0%	Silt	79.5%
Silt & Clay (% Passing #200):	91.0%	Total Sand:	9.0%	Clay	11.5%
Unit Relative Density (Assumed)	2.200	Moisture Content	18.5%	Colloids	
Liquid Limit	NP	Plastic Limit	NP	Plastic Index	NP
Coarse Sand:	0.0%	Medium Sand:	0.2%	Fine Sand:	8.9%

Description of Sand and Gravel	Rounded <input type="checkbox"/>	Angular <input checked="" type="checkbox"/>	Hard & Durable <input checked="" type="checkbox"/>	Soft <input type="checkbox"/>	Weathered & Friable <input type="checkbox"/>
Mechanical Stirring Apparatus A	Dispersion Period:	1 min.	Dispersing Agent:	Sodium Hexametaphosphate:	40 g./ Liter

References / Comments / Deviations: ASTM D 4318, D 854, D 2487

Technician Name: *Kyle Baucom* Date: *10/15/12*

Kyle Baucom
Technical Responsibility

Kyle Baucom
Signature

Project Engineer
Position

10/16/12
Date

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Moisture - Density Relationship



ASTM D558, D698, D1557, AASHTO T99, T180

Quality Assurance

S&ME, Inc.~ 9751 Southern Pine Boulevard~Charlotte, NC 28273

Project #:	1356-11-032	Phase 03	Report Date:	11/2/12
Project Name:	Marshall Industrial Landfill No. 1 - Cells 3 & 4		Test Date(s)	10/2-11/2/12
Client Name:	Duke Energy			
Client Address:	526 South Church Street, Charlotte, NC 28202			
Boring #:	NA	Sample #:	SG-9	Sample Date:
Location:	Grid D3	Offset:	NA	Depth:
Sample Description:	Black Gray Silt (ML)			
Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #
Balance (0.1 g)	22182	6/8/2012	Compaction Mold	20231
Balance	22182	6/8/2012	Compaction Hammer	20222
Straightedge	20179	8/7/2012	Oven	10844
Sieve	22100	10/1/2012		

Water Content		Water Content requires GP 2 Balance (0.1 gram Readability).				Check:	
ASTM D2216 <input checked="" type="checkbox"/>		AASHTO T265 <input type="checkbox"/>		ASTM D4959 <input type="checkbox"/>		ASTM D4643 <input type="checkbox"/>	
Water Added:							
Tare #:		SR	PFM	79	L-18	85	
A. Tare Weight	A.	165.1	166.8	72.6	87.7	74.4	
B. Wet Wt + Tare Wt	B.	1142.4	1136.7	944.1	828.3	989.1	
C. Dry Wt. + Tare Wt.	C.	959.9	938.9	753.9	703.8	773.2	
D. Water Weight	B-C	182.5	197.8	190.2	124.5	215.9	
E. Dry Weight	C-A	794.8	772.1	681.3	616.1	698.8	
F. Moisture Content	100*D/E	23.0%	25.6%	27.9%	20.2%	30.9%	
Compaction Data		Requires a GP 5 Balance for ASTM (1 gram or .0022 Lb. readability).				Check:	
ASTM D558 <input type="checkbox"/>		ASTM D 698 <input checked="" type="checkbox"/>		ASTM D1557 <input type="checkbox"/>		AASHTO T99 <input type="checkbox"/>	
Method A <input checked="" type="checkbox"/>		Method B <input type="checkbox"/>		Method C <input type="checkbox"/>		Method D (ASTM 1978) <input type="checkbox"/>	
						AASHTO T180 <input type="checkbox"/>	
						AASHTO Method D <input type="checkbox"/>	
G. Wt of Soil + Mold	G.	5706	5768	5764	5641	5746	
H. Wt. of Mold	H.	4239	4239	4239	4239	4239	
I. Wt. of Soil (g. or lbs.)	G-H	1467	1529	1525	1402	1507	
J. Wt of Soil (Lbs.)	1/453.6 or I	3.234	3.371	3.362	3.091	3.322	
K. Mold Volume Factor	K.	30.09	30.09	30.09	30.09	30.09	
L. Wet Density (PCF)	J*K	97.3	101.4	101.2	93.0	100.0	
M. Dry Density (PCF)	L/(1+F)	79.1	80.7	79.1	77.4	76.4	
Sieve Size used to separate the Oversize Fraction:		#4 Sieve <input checked="" type="checkbox"/>		3/8 inch Sieve <input type="checkbox"/>		3/4 inch Sieve <input type="checkbox"/>	
Mechanical Rammer <input type="checkbox"/>		Manual Rammer <input checked="" type="checkbox"/>		Moist Preparation <input type="checkbox"/>		Dry Preparation <input checked="" type="checkbox"/>	

References / Comments / Deviations: ASTM D 4318, D 854, D 2487, C 127

Oven Temperature Set at 60C.

Jennifer Olsen
Technician Name

Signature

NICET 117926
Certification Type/No.

11/2/2012
Date

Kyle Baucom
Technical Responsibility

Signature

Project Engineer
Position

11/5/12
Date

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Moisture - Density Report



Quality Assurance

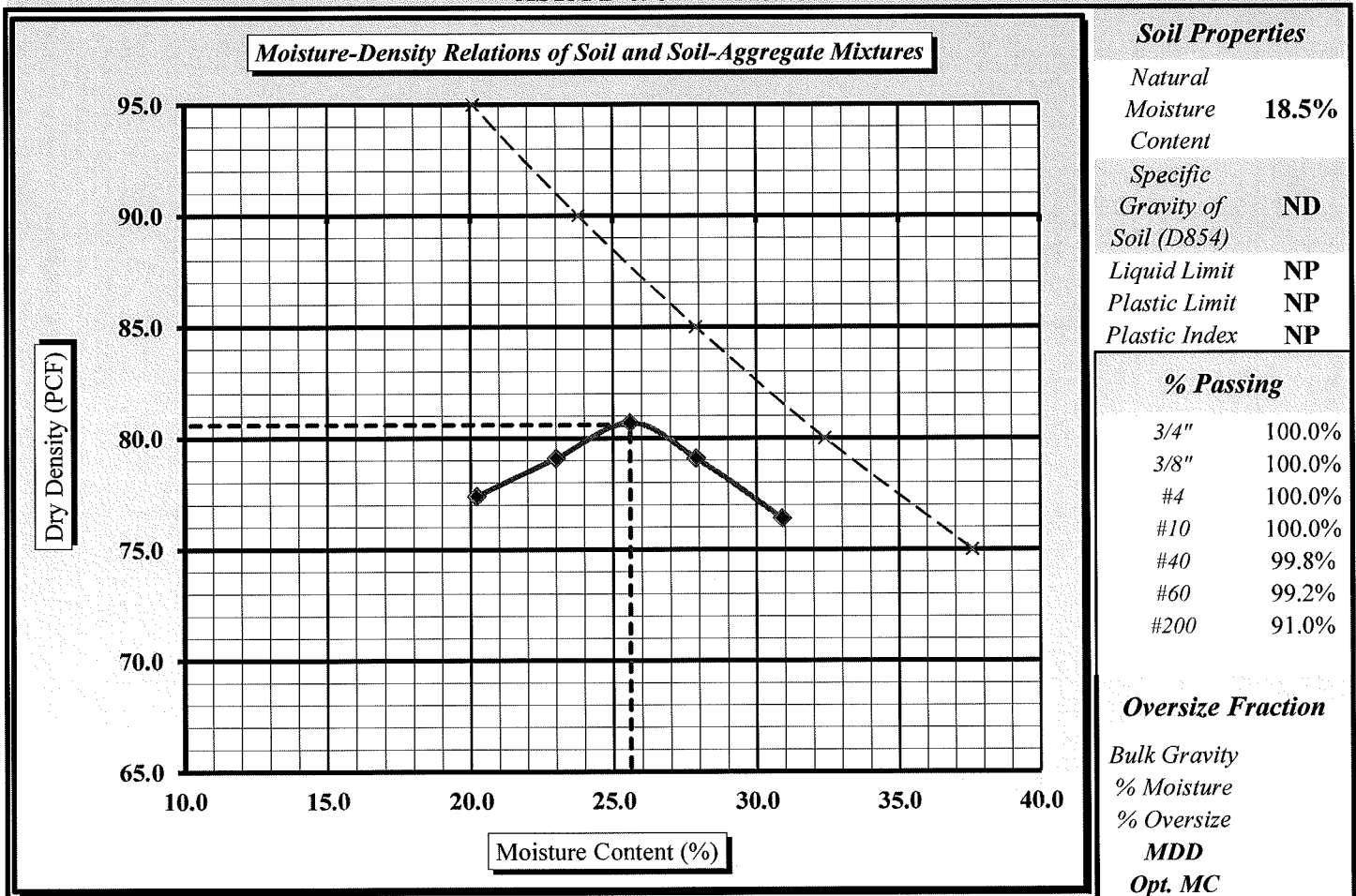
S&ME, Inc.~ 9751 Southern Pine Boulevard~Charlotte, NC 28273

S&ME Project #:	1356-11-032	Phase 03	Report Date:	11/2/12	
Project Name:	Marshall Industrial Landfill No. 1 - Cells 3 & 4		Test Date(s):	10/2-11/2/12	
Client Name:	Duke Energy				
Client Address:	526 South Church Street, Charlotte, NC 28202				
Boring #:	NA	Sample #:	SG-9	Sample Date:	9/2/2012
Location:	Grid D3	Offset:	NA	Depth:	NA
Sample Description:	Black Gray Silt (ML)				

Maximum Dry Density 80.6 PCF.

Optimum Moisture Content 25.6%

ASTM D 698 -- Method A



Moisture-Density Curve Displayed: Fine Fraction ☒ Corrected for Oversize Fraction (ASTM D 4718) ☐
 Sieve Size used to separate the Oversize Fraction: #4 Sieve ☒ 3/8 inch Sieve ☐ 3/4 inch Sieve ☐
 Mechanical Rammer ☐ Manual Rammer ☒ Moist Preparation ☐ Dry Preparation ☒
 References / Comments / Deviations: ASTM D 854: Specific Gravity of Soils

Technician Name: Jennifer Olsen

Date: 11/2/12

Kyle Baucom
Technical Responsibility

Signature

Project Engineer
Position

11/5/12
Date

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Quality Assurance

6/25/12

1356-11-032 Phase 03 SG-10 Moisture.xls
Page 1 of 2

Liquid Limit, Plastic Limit, and Plastic Index



Another code

ASTM D 4318



AASHTO T 89



AASHTO T 90

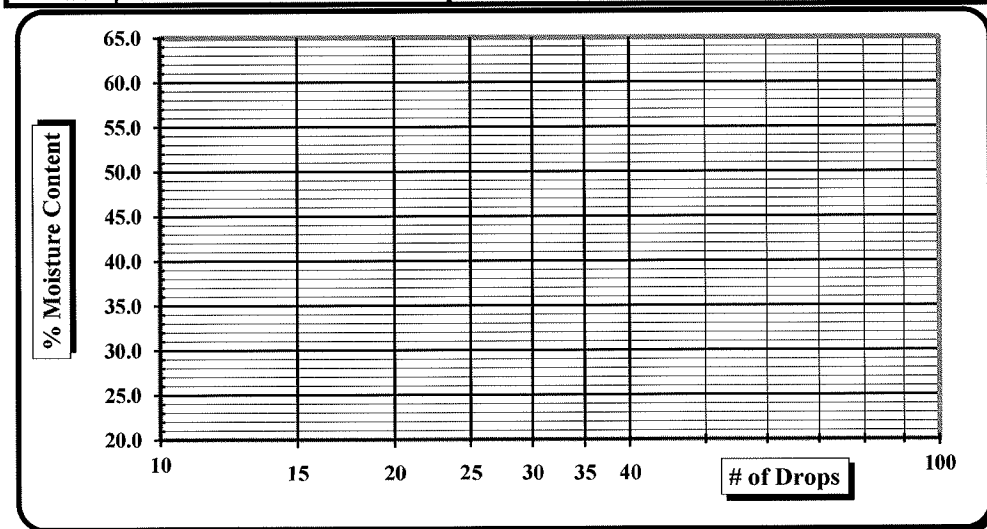


Quality Assurance

S&ME, Inc. ~9751 Southern Pine Boulevard, Charlotte, NC 28273

Project #:	1356-11-032 Phase 03		Report Date:	10/17/12	
Project Name:	Marshall Industrial Landfill No.1- Cells 3&4		Test Date(s)	10/11-17/12	
Client Name:	Duke Energy				
Client Address:	526 South Church Street, Charlotte, NC 28202				
Boring #:	NA	Sample #:	SG-10	Sample Date:	10/8/12
Location:	Grid C4	Offset:	NA	Elevation:	NA
Sample Description:	Black Gray Silt (ML) Fly Ash				
<i>Type and Specification</i>	<i>S&ME ID #</i>	<i>Cal Date:</i>	<i>Type and Specification</i>	<i>S&ME ID #</i>	<i>Cal Date:</i>
Balance (0.01 g)	3222	6/25/2012	Grooving tool	20165	12/20/2011
LL Apparatus	20230	6/26/2012	Grooving tool		
Oven	10844	9/9/2012	Grooving tool		

Pan #	Tare #:	Liquid Limit						Plastic Limit		
A	Tare Weight									
B	Wet Soil Weight + A									
C	Dry Soil Weight + A									
D	Water Weight (B-C)									
E	Dry Soil Weight (C-A)									
F	% Moisture (D/E)*100									
N	# OF DROPS							Moisture Contents determined by ASTM D 2216		
LL	LL = F * FACTOR									
Ave.	Average									



NP, Non-Plastic ☒
 Liquid Limit
 Plastic Limit
 Plastic Index
 Group Symbol ML

Multipoint Method ☒
 One-point Method ☐

Wet Preparation ☐ Dry Preparation ☒ Air Dried ☒

Estimate the % Retained on the #40 Sieve:

Notes / Deviations / References:

Oven Temperature Set at 60C.

ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils

Karen Warner
Technician Name

10/17/12
Date

Kyle Baucom
Technical Responsibility

10/18/12
Date

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Particle Size Analysis of Soils



ASTM D 422

S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273

Project #: 1356-11-032 Phase 03

Report Date: 10/17/12

Project Name:		Marshall Industrial Landfill No. 1 - Cells 3&4		Test Date(s): 10/11-17/12	
Client Name:		Duke Energy		Address: 526 South Church Street, Charlotte, NC 28202	
Boring #:	NA	Sample #:	SG-10	Sample Date:	10/8/12
Location:	Grid C4	Offset:	NA	Elevation:	NA
Sample Description: Black Gray Silt (ML) Fly Ash					
Pan #:		Beaker #:		Apparent Relative Density (Assumed) 2.200	
Hydrometer Jar #:					
Pan Tare Weight (grams):					
Total Sample Air Dried Wt. + tare wt. (grams):		Tare #		Hygroscopic	
Weight of Total Sample Air Dried:		Tare Wt.		Natural	
Weight of Air Dried Hydrometer Sample (g):		Wet Wt. + A		G-11	
Total Sample Oven Dried:		Dry Wt. + A		305.38	
Hydrometer Sample Oven Dried (W):		Water Wt. (B-C)		45.78	
% Passing #10:		Dry Wt. (C-A)		221.90	
Correction Factor a (Table 1):		% Moisture (100 x D/E)		4.66%	
Description of Sand & Gravel Particles		Rounded		Soft	
Stirring Apparatus: A		B		Weathered & Friable	
Balance: ID No. 3222		Cal. Date: 6/25/2012		Dispersion Time: 1 min.	
		Hydrometer: ID No. 3901		Sodium Hexametaphosphate: 40 g./Liter	
		Cal. Date: 3/25/2012			
Control Cylinder <input checked="" type="checkbox"/> Composite Correction <input type="checkbox"/> Type: 151H <input type="checkbox"/> 152H <input checked="" type="checkbox"/>					
Time	Temp.	Hydrometer	Corrections	Hydrometer	Percent Passing
T (Min.)	(0.5 °C)	Reading	Control	R	P (#10) = (R x a / W) x 100
1	23.5	42.0	Cylinder	37.00	P (total) = P x % Passing #10
2	23.5	38.0	5.0	33.00	84.4%
5	23.5	27.5	5.0	22.50	75.3%
15	23.5	16.0	5.0	11.00	51.3%
30	23.5	12.0	5.0	7.00	25.1%
60	23.5	10.0	5.0	5.00	16.0%
250	23.5	7.0	5.0	2.00	11.4%
1440	22.5	6.0	4.5	1.50	4.6%
References / Comments / Deviations ASTM D 422, D 2487, D 4318					
Oven Temperature was set at 60C.					

Karen Warner
Technician NameNICET 117900
Certification #Kyle Baucom
Technical ResponsibilityProject Engineer
Position10/18/12
Date

Particle Size Analysis of Soils



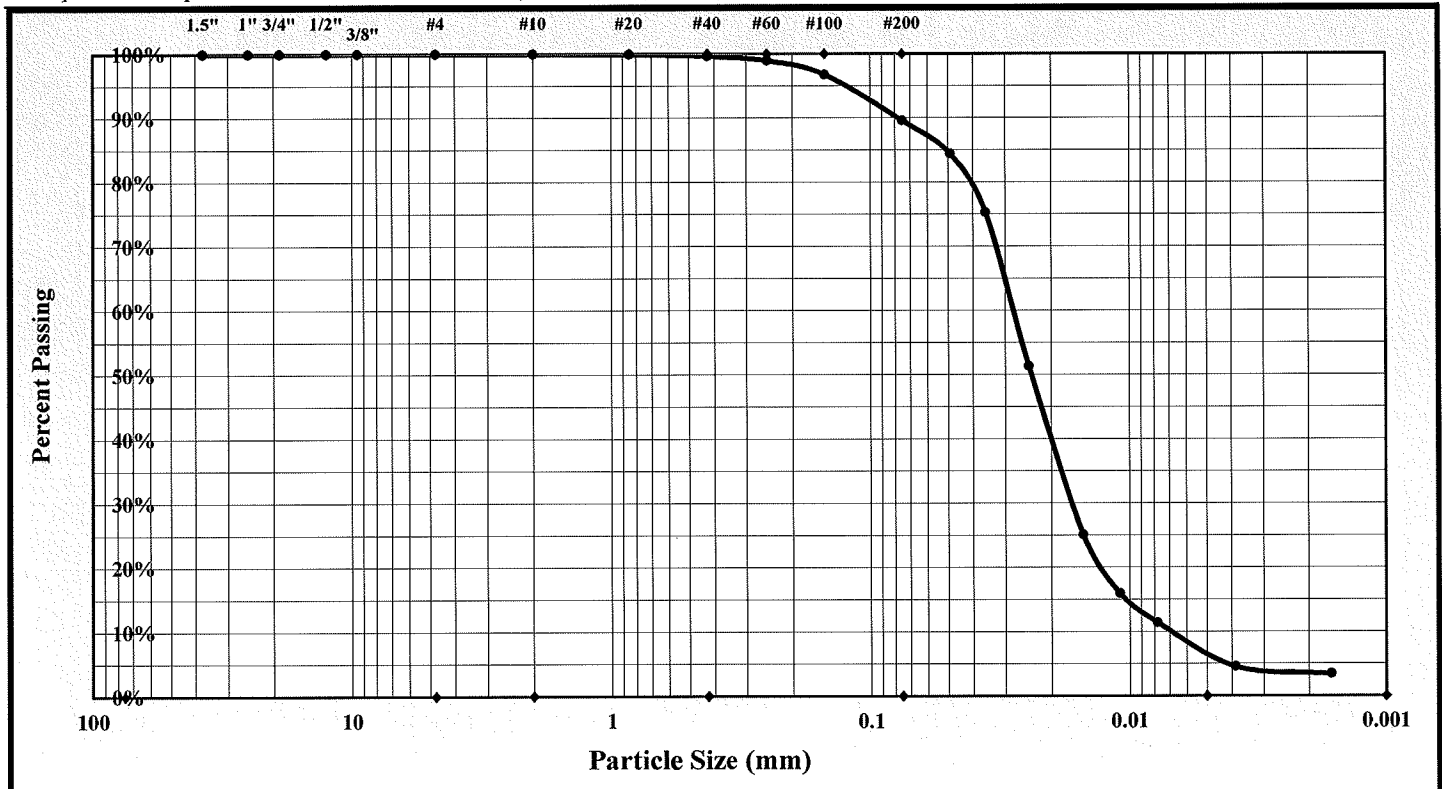
ASTM D422

Quality Assurance

S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273

S&ME Project #:	1356-11-032 Phase 03	Report Date:	10/17/12
Project Name:	Marshall Industrial Landfill No. 1 - Cells 3&4	Test Date(s):	10/11-17/12
Client Name:	Duke Energy		
Address:	526 South Church Street, Charlotte, NC 28202		
Boring #:	NA	Sample #:	SG-10
		Sample Date:	10/8/12
Location:	Grid C4	Offset:	NA
		Elevation:	NA

Sample Description: Black Gray Silt (ML) Fly Ash



Cobbles	< 300 mm (12\") and > 75 mm (3\")	Fine Sand	< 0.425 mm and > 0.075 mm (#200)
Gravel	< 75 mm and > 4.75 mm (#4)	Silt	< 0.075 and > 0.005 mm
Coarse Sand	< 4.75 mm and > 2.00 mm (#10)	Clay	< 0.005 mm
Medium Sand	< 2.00 mm and > 0.425 mm (#40)	Colloids	< 0.001 mm

Maximum Particle Size:	#10	Gravel:	0.0%	Silt	83.1%
Silt & Clay (% Passing #200):	89.6%	Total Sand:	10.4%	Clay	6.5%
Relative Density (Assumed)	2.200	Moisture Content	20.6%	Colloids	
Liquid Limit	NP	Plastic Limit	NP	Plastic Index	NP
Coarse Sand:	0.0%	Medium Sand:	0.4%	Fine Sand:	10.0%
Description of Sand and Gravel	Rounded <input type="checkbox"/> Angular <input checked="" type="checkbox"/>	Hard & Durable <input checked="" type="checkbox"/> Soft <input type="checkbox"/>	Weathered & Friable <input type="checkbox"/>		
Mechanical Stirring Apparatus A	Dispersion Period:	1 min.	Dispersing Agent:	Sodium Hexametaphosphate:	40 g./ Liter

References / Comments / Deviations: ASTM D 4318, D 854, D 2487

Technician Name: Kyle Baucom Date: 10/17/12

Kyle Baucom
Technical Responsibility

Kyle Baucom
Signature

Project Engineer
Position

10/18/12
Date

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Moisture - Density Relationship



ASTM D558, D698, D1557, AASHTO T99, T180

Quality Assurance

S&ME, Inc.~ 9751 Southern Pine Boulevard~Charlotte, NC 28273

Project #:	1356-11-032	Phase 03	Report Date:	11/2/12
Project Name:	Marshall Industrial Landfill No. 1 - Cells 3 & 4		Test Date(s)	10/11-11/2/12
Client Name:	Duke Energy			
Client Address:	526 South Church Street, Charlotte, NC 28202			
Boring #:	NA	Sample #:	SG-10	Sample Date:
Location:	Grid C4	Offset:	NA	Depth:
Sample Description:	Black Gray Silt (ML)			

Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #	Cal Date:
Balance (0.1 g)	22182	6/8/2012	Compaction Mold	20231	1/6/2012
Balance	22182	6/8/2012	Compaction Hammer	20222	6/6/2012
Straightedge	20179	8/7/2012	Oven	10844	5/9/2012
Sieve	22100	10/1/2012			

Water Content		Water Content requires GP 2 Balance (0.1 gram Readability).				Check:	
ASTM D2216 <input checked="" type="checkbox"/>		AASHTO T265 <input type="checkbox"/>		ASTM D4959 <input type="checkbox"/>		ASTM D4643 <input type="checkbox"/>	
Water Added:							
Tare #:		CJ	691	5I	G	KO	
A. Tare Weight	A.	157.6	157.2	162.7	158.8	167.5	
B. Wet Wt + Tare Wt	B.	1116.2	1000.7	1027.7	1026.9	1102.6	
C. Dry Wt. + Tare Wt.	C.	924.1	818.5	867.3	880.0	884.7	
D. Water Weight	B-C	192.1	182.2	160.4	146.9	217.9	
E. Dry Weight	C-A	766.5	661.3	704.6	721.2	717.2	
F. Moisture Content	100*D/E	25.1%	27.6%	22.8%	20.4%	30.4%	

Compaction Data		Requires a GP 5 Balance for ASTM (1 gram or .0022 Lb. readability).				Check:	
ASTM D558 <input type="checkbox"/>		ASTM D 698 <input checked="" type="checkbox"/>		ASTM D1557 <input type="checkbox"/>		AASHTO T99 <input type="checkbox"/>	
Method A <input checked="" type="checkbox"/>		Method B <input type="checkbox"/>		Method C <input type="checkbox"/>		Method D (ASTM 1978) <input type="checkbox"/>	
AASHTO T180 <input type="checkbox"/>		AASHTO Method D <input type="checkbox"/>					
G. Wt of Soil + Mold	G.	5761	5763	5704	5657	5742	
H. Wt. of Mold	H.	4239	4239	4239	4239	4239	
I. Wt. of Soil (g. or lbs.)	G-H	1522	1524	1465	1418	1503	
J. Wt of Soil (Lbs.)	I/453.6 or 1	3.355	3.360	3.230	3.126	3.313	
K. Mold Volume Factor	K.	30.09	30.09	30.09	30.09	30.09	
L. Wet Density (PCF)	J*K	101.0	101.1	97.2	94.1	99.7	
M. Dry Density (PCF)	L/(1+F)	80.7	79.2	79.2	78.2	76.5	
Sieve Size used to separate the Oversize Fraction:		#4 Sieve <input checked="" type="checkbox"/>		3/8 inch Sieve <input type="checkbox"/>		3/4 inch Sieve <input type="checkbox"/>	
Mechanical Rammer <input type="checkbox"/>		Manual Rammer <input checked="" type="checkbox"/>		Moist Preparation <input type="checkbox"/>		Dry Preparation <input checked="" type="checkbox"/>	

References / Comments / Deviations: ASTM D 4318, D 854, D 2487, C 127

Oven Temperature Set at 60C.

Jennifer Olsen
Technician Name

Jennifer Olsen
Signature

NICET 117926
Certification Type/No.

11/2/2012
Date

Kyle Baucom
Technical Responsibility

Kyle Baucom
Signature

Project Engineer
Position

11/5/12
Date

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Moisture - Density Report



Quality Assurance

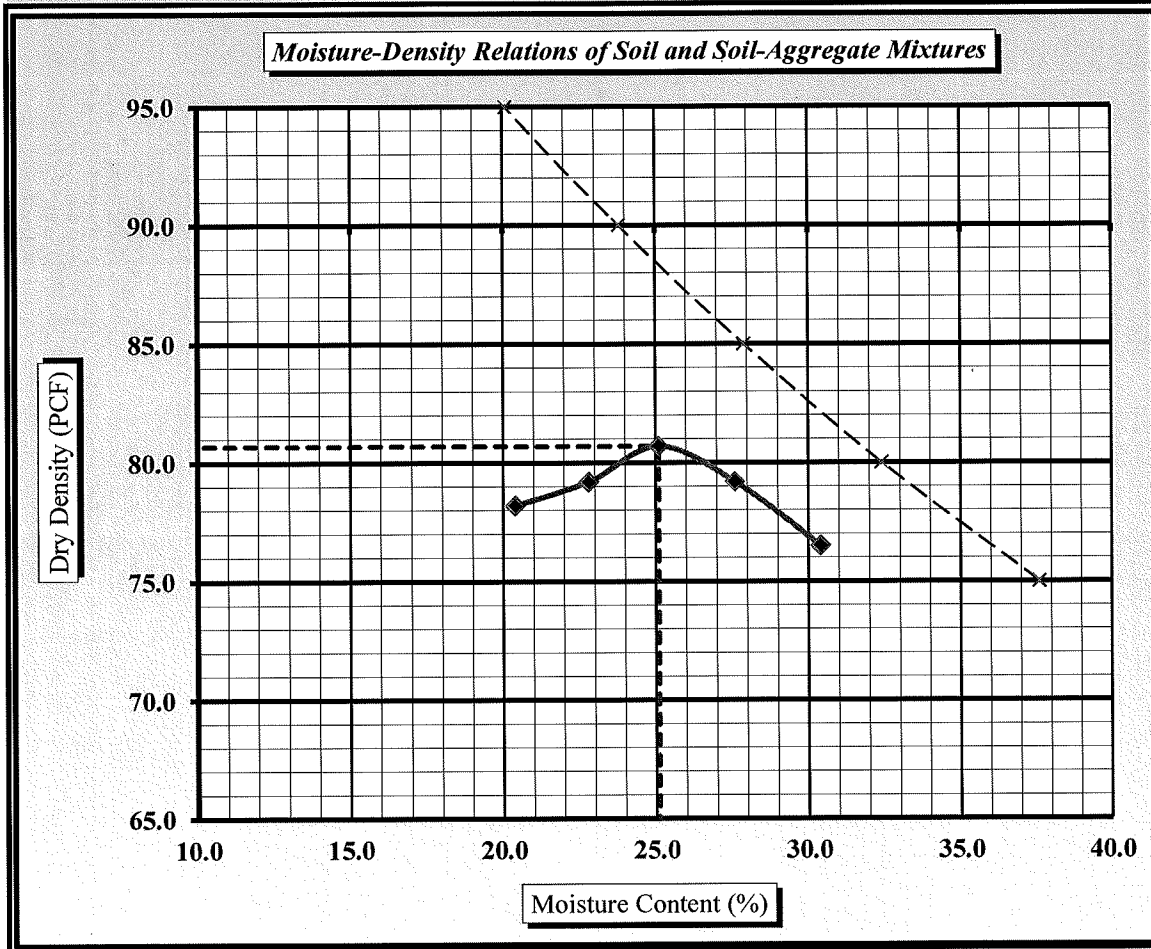
S&ME, Inc.~ 9751 Southern Pine Boulevard~Charlotte, NC 28273

S&ME Project #:	1356-11-032	Phase 03	Report Date:	11/2/12	
Project Name:	Marshall Industrial Landfill No. 1 - Cells 3 & 4		Test Date(s):	10/11-11/2/12	
Client Name:	Duke Energy				
Client Address:	526 South Church Street, Charlotte, NC 28202				
Boring #:	NA	Sample #:	SG-10	Sample Date:	10/8/2012
Location:	Grid C4	Offset:	NA	Depth:	NA
Sample Description:	Black Gray Silt (ML)				

Maximum Dry Density 80.7 PCF.

Optimum Moisture Content 25.1%

ASTM D 698 -- Method A



Soil Properties

Natural Moisture Content	20.6%
Specific Gravity of Soil (D854)	ND
Liquid Limit	NP
Plastic Limit	NP
Plastic Index	NP

% Passing

3/4"	100.0%
3/8"	100.0%
#4	100.0%
#10	100.0%
#40	99.6%
#60	99.0%
#200	89.6%

Oversize Fraction

Bulk Gravity
% Moisture
% Oversize
MDD
Opt. MC

Moisture-Density Curve Displayed: Fine Fraction ☒ Corrected for Oversize Fraction (ASTM D 4718) ☐
 Sieve Size used to separate the Oversize Fraction: #4 Sieve ☒ 3/8 inch Sieve ☐ 3/4 inch Sieve ☐
 Mechanical Rammer ☐ Manual Rammer ☒ Moist Preparation ☐ Dry Preparation ☒

References / Comments / Deviations: ASTM D 854: Specific Gravity of Soils

Technician Name: Jennifer Olsen

Date: 11/2/12

Kyle Baucom
Technical Responsibility

Signature

Project Engineer
Position

11/5/12
Date

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Liquid Limit, Plastic Limit, and Plastic Index



Another code

ASTM D 4318 ☒AASHTO T 89 ☐AASHTO T 90 ☐

Quality Assurance

S&ME, Inc. ~9751 Southern Pine Boulevard, Charlotte, NC 28273

Project #: 1356-11-032 Phase 03

Report Date: 11/26/12

Project Name: Marshall Industrail Landfill No.1 - Cells 3&4

Test Date(s) 11/6-26/12

Client Name: Duke Energy

Client Address: 526 South Church Street, Charlotte, NC 28202

Boring #: NA

Sample #: SG-11

Sample Date: 11/2/12

Location: Grid D2

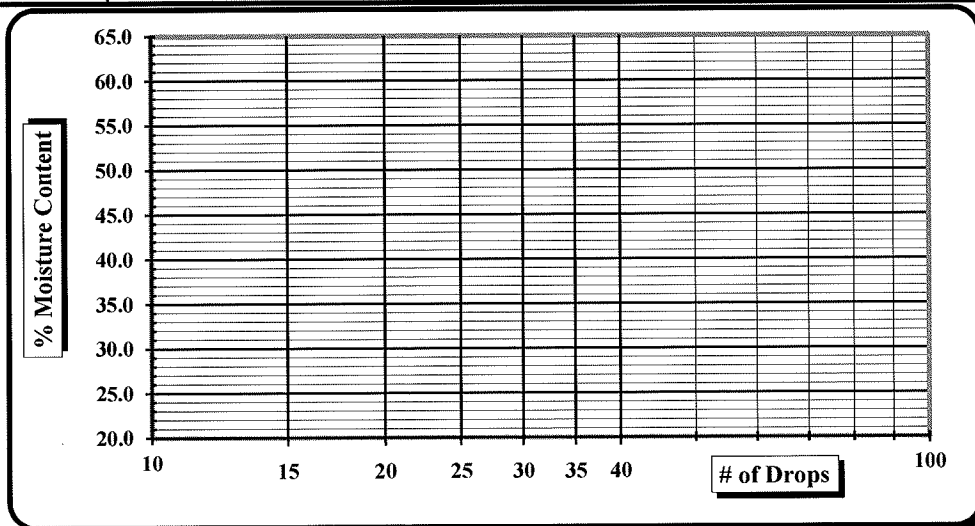
Offset: NA

Elevation: NA

Sample Description: Black Gray Silt (ML) Fly Ash

Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #	Cal Date:
Balance (0.01 g)	3222	6/25/2012	Grooving tool	20837	10/29/2012
LL Apparatus	5/21/1955	6/26/2012	Grooving tool		
Oven	10844	9/4/2012	Grooving tool		

Pan #	Tare #:	Liquid Limit						Plastic Limit		
A	Tare Weight									
B	Wet Soil Weight + A									
C	Dry Soil Weight + A									
D	Water Weight (B-C)									
E	Dry Soil Weight (C-A)									
F	% Moisture (D/E)*100									
N	# OF DROPS							Moisture Contents determined by ASTM D 2216		
LL	LL = F * FACTOR									
Ave.	Average									



One Point Liquid Limit			
N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic ☒

Liquid Limit

Plastic Limit

Plastic Index

Group Symbol ML

Multipoint Method ☒One-point Method ☐Wet Preparation ☐Dry Preparation ☒Air Dried ☒

Estimate the % Retained on the #40 Sieve:

Notes / Deviations / References:

ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils

Karen Warner

Technician Name

11/26/12
Date

Kyle Baucom

Technical Responsibility

11/7/12
Date

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Particle Size Analysis of Soils



ASTM D 422

S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273

Project #: 1356-11-032 Phase 03

Report Date: 11/26/12

Project Name: Marshall Industrial Landfill No. 1 - Cells 3&4 Test Date(s): 11/6-15/12

Client Name:	Duke Energy	Address:	526 South Church Street, Charlotte, NC 28202	Sieve	Retained Wt.	Percent Passing
Boring #:	NA	Sample #:	SG-11	3.0"	0.0	100.0%
Location:	Grid D2	Offset:	NA	1.5"	0.0	100.0%
Sample Description:	Black Gray Silt (ML)	Elevation:	NA	1.0"	0.0	100.0%
Pan #:		Beaker #:		3/4"	0.0	100.0%
Hydrometer Jar #:		Apparent Relative Density (Assumed)	2.200	1/2"	0.0	100.0%
Pan Tare Weight (grams):		Moisture Content		3/8"	0.0	100.0%
Total Sample Air Dried Wt. + tare wt. (grams):		Tare #		#4	0.0	100.0%
Weight of Total Sample Air Dried:		Tare Wt.		#10	0.26	99.9%
Weight of Air Dried Hydrometer Sample (g):		Wet Wt. + A		#20	0.03	99.9%
Total Sample Oven Dried:		Dry Wt. + A		#40	0.09	99.7%
Hydrometer Sample Oven Dried (W):		Water Wt. (B-C)		#60	0.35	99.2%
% Passing #10:		Dry Wt. (C-A)		#100	1.17	97.6%
Correction Factor a (Table 1):		% Moisture (100 x D/E)		#200	4.68	90.5%

Description of Sand & Gravel Particles ☒ Rounded ☐ Angular ☒ Hard & Durable ☒ Soft ☐ Weathered & Friable ☐Stirring Apparatus: A ☒ B ☐ Dispersion Time: 1 min. Sodium Hexametaphosphate: 40 g./ Liter

Balance: ID No. 3222 Cal. Date: 6/25/2012 Hydrometer: ID No. 3901 Cal. Date: 3/25/2012

Control Cylinder ☒ Composite Correction ☐ Type: 151H ☐ 152H ☒

Time	Temp.	Hydrometer	Corrections	Hydrometer	Percent Passing	Effective	Table 3	Diameter
T (Min.)	(0.5 °C)	Reading	Control Cylinder	Composite Correction	P(-#10) = (R x a / W) x 100	Depth	K	D = K x (L/T) ^{1/2}
1	22.5	42.0	5.0		80.9%	10.2	0.01553	0.04967
2	22.5	39.5	5.0		75.4%	10.6	0.01553	0.03582
5	22.5	31.5	5.0		57.9%	11.9	0.01553	0.02401
15	22.5	20.0	5.0		32.8%	13.8	0.01553	0.01492
30	22.5	15.0	5.0		21.9%	14.7	0.01553	0.01086
60	22.5	13.0	5.0		17.5%	15.0	0.01553	0.00776
250	22.5	9.5	5.0		9.8%	15.6	0.01553	0.00387
1440	21.5	7.5	5.0		5.5%	15.9	0.01571	0.00165

References / Comments / Deviations ASTM D 422, D 2487, D 4318

Oven Temperature Set At 60C.

Karen Warner

Technician Name

NICET 117900

Certification #

Kyle Baucom

Technical Responsibility

Project Engineer

Position

12/3/12

Date

Moisture - Density Relationship



ASTM D558, D698, D1557, AASHTO T99, T180

Quality Assurance

S&ME, Inc.~ 9751 Southern Pine Boulevard~Charlotte, NC 28273

Project #:	1356-11-032	Phase 03	Report Date:	11/26/12
Project Name:	Marshall Industrial Landfill No. 1 - Cells 3 & 4		Test Date(s)	11/6-12/12
Client Name:	Duke Energy			
Client Address:	526 South Church Street, Charlotte, NC 28202			
Boring #:	NI	Sample #:	SG-11	Sample Date: 11/2/2012
Location:	Grid D2	Offset:	NI	Depth: NI
Sample Description:	Black Gray Silt (ML) Fly Ash			
Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID # Cal Date:
Balance (0.1 g)	22182	6/8/2012	Compaction Mold	20231 1/6/2012
Balance	22182	6/8/2012	Compaction Hammer	21598 7/25/2012
Straightedge	20179	8/7/2012	Oven	22151 7/13/2012
Sieve #4	22100	10/1/2012		

Water Content		Water Content requires GP 2 Balance (0.1 gram Readability).				Check:	
ASTM D2216 <input checked="" type="checkbox"/>		AASHTO T265 <input type="checkbox"/>		ASTM D4959 <input type="checkbox"/>		ASTM D4643 <input type="checkbox"/>	
Water Added:		200	250	300	350		
Tare #:		JRC	MAC	5E	DJM		
A. Tare Weight	A.	157.0	161.2	157.2	160.7		
B. Wet Wt + Tare Wt	B.	1045.5	1097.4	1134.5	1113.0		
C. Dry Wt. + Tare Wt.	C.	902.2	929.4	943.6	909.8		
D. Water Weight	B-C	143.3	168.0	190.9	203.2		
E. Dry Weight	C-A	745.2	768.2	786.4	749.1		
F. Moisture Content	100*D/E	19.2%	21.9%	24.3%	27.1%		
Compaction Data		Requires a GP 5 Balance for ASTM (1 gram or .0022 Lb. readability).				Check:	
ASTM D558 <input type="checkbox"/>		ASTM D 698 <input checked="" type="checkbox"/>		ASTM D1557 <input type="checkbox"/>		AASHTO T99 <input type="checkbox"/>	
Method A <input checked="" type="checkbox"/>		Method B <input type="checkbox"/>		Method C <input type="checkbox"/>		AASHTO T180 <input type="checkbox"/>	
				Method D (ASTM 1978) <input type="checkbox"/>		AASHTO Method D <input type="checkbox"/>	
G. Wt of Soil + Mold	G.	5701	5762	5815	5793		
H. Wt. of Mold	H.	4239	4239	4239	4239		
I. Wt. of Soil (g. or lbs.)	G-H	1462	1523	1576	1554		
J. Wt of Soil (Lbs.)	I/453.6 or 1	3.223	3.358	3.474	3.426		
K. Mold Volume Factor	K.	30.09	30.09	30.09	30.09		
L. Wet Density (PCF)	J*K	97.0	101.0	104.5	103.1		
M. Dry Density (PCF)	L/(1+F)	81.4	82.9	84.1	81.1		
Sieve Size used to separate the Oversize Fraction:		#4 Sieve <input checked="" type="checkbox"/>		3/8 inch Sieve <input type="checkbox"/>		3/4 inch Sieve <input type="checkbox"/>	
Mechanical Rammer <input type="checkbox"/>		Manual Rammer <input checked="" type="checkbox"/>		Moist Preparation <input type="checkbox"/>		Dry Preparation <input checked="" type="checkbox"/>	

References / Comments / Deviations: NI = Information not provided. ND = Not determined.

Jennifer Olsen
Technician Name

Jennifer Olsen
Signature

NICET / 117926
Certification Type/No.

11/12/2012
Date

Kyle Baucom
Technical Responsibility

Kyle Baucom
Signature

Project Engineer
Position

12/7/12
Date

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Moisture - Density Report



Quality Assurance

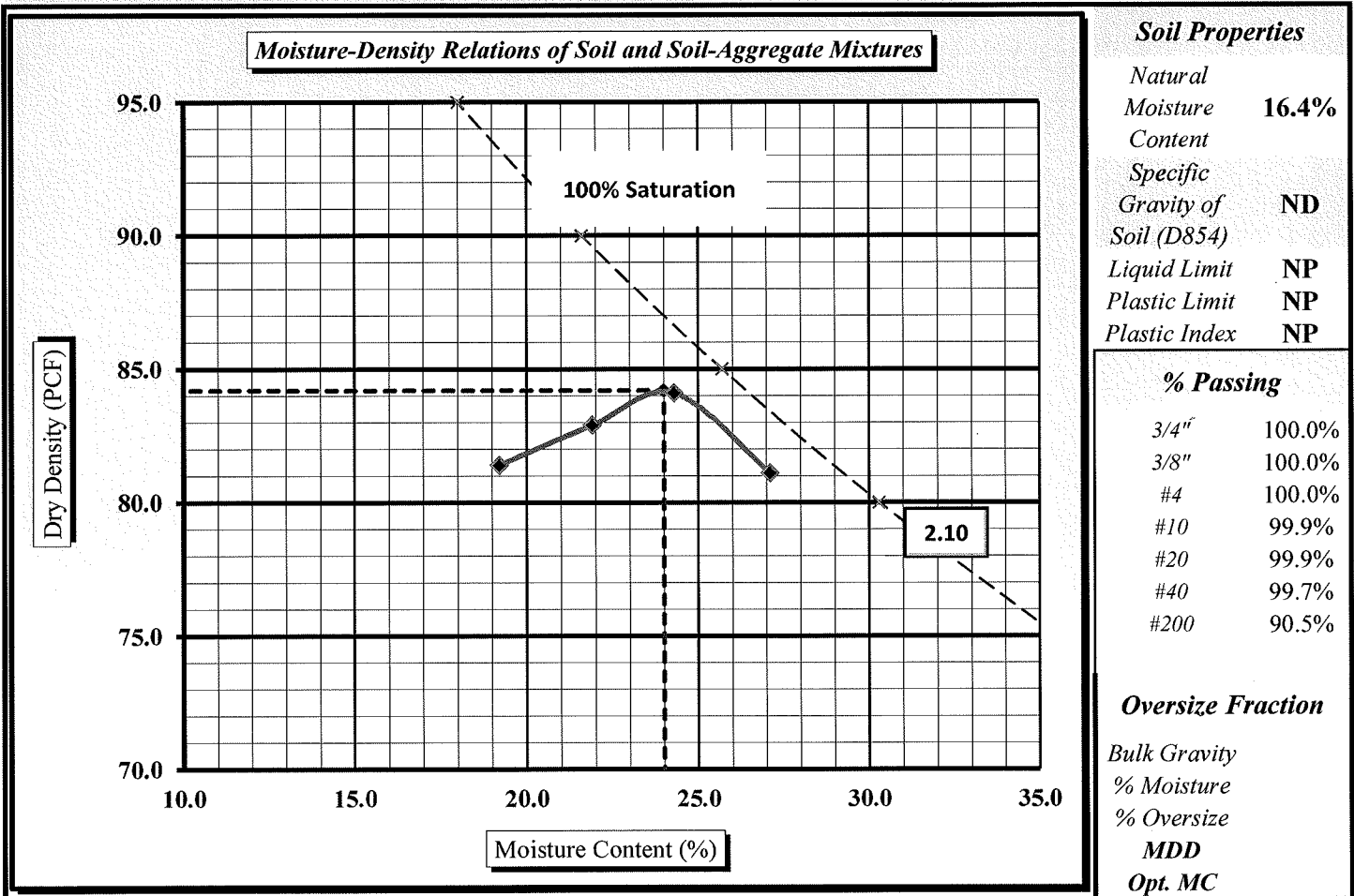
S&ME, Inc.~ 9751 Southern Pine Boulevard~Charlotte, NC 28273

S&ME Project #:	1356-11-032	Phase 03	Report Date:	11/26/12	
Project Name:	Marshall Industrial Landfill No. 1 - Cells 3 & 4		Test Date(s):	11/6-12/12	
Client Name:	Duke Energy				
Client Address:	526 South Church Street, Charlotte, NC 28202				
Boring #:	NI	Sample #:	SG-11	Sample Date:	11/2/2012
Location:	Grid D2	Offset:	NI	Depth:	NI
Sample Description:	Black Gray Silt (ML) Fly Ash				

Maximum Dry Density 84.2 PCF.

Optimum Moisture Content 24.0%

ASTM D 698 -- Method A



Moisture-Density Curve Displayed: Fine Fraction ☒ Corrected for Oversize Fraction (ASTM D 4718) ☐
 Sieve Size used to separate the Oversize Fraction: #4 Sieve ☒ 3/8 inch Sieve ☐ 3/4 inch Sieve ☐
 Mechanical Rammer ☐ Manual Rammer ☒ Moist Preparation ☐ Dry Preparation ☒

References / Comments / Deviations: NI = Information not provided. ND = Not determined.

Technician Name: Jennifer Olsen *Jennifer L Olsen*

Date: 11/12/12

Kyle Baucom
Technical Responsibility

Kyle Baucom
Signature

Project Engineer
Position

12/7/12
Date

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Laboratory Determination of Water Content



ASTM D 2216



AASHTO T 265



Quality Assurance

S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273

Project #:	1356-11-032 Phase 03	Report Date:	1/9/13
Project Name:	Marshall Industrial Landfill No.1 - Cells 3&4	Test Date(s):	12/13-17/12
Client Name:	Duke Energy		
Client Address:	526 South Church Street, Charlotte, NC 28202		
Sample by:	Earl Alexander	Sample Date(s):	12/11/12
Sampling Method:	NA	Drill Rig :	NA

Method: **A (1%)** ☐ **B (0.1%)** ☒ *Balance ID.* **3222** *Calibration Date:* **6/25/12**

[illegible]

Notes / Deviations / References

Oven Temperature Set at 60C.

ASTM D 2216: Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass

Karen Warner
Technician Name

Spencer Hansen
Signature

NICET 117900
Certification Type / No.

1/9/13
Date

Kyle Baucom
Technical Responsibility

Signature

Project Engineer
Position

1/9/13
Date

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Liquid Limit, Plastic Limit, and Plastic Index



Another code

ASTM D 4318



AASHTO T 89



AASHTO T 90

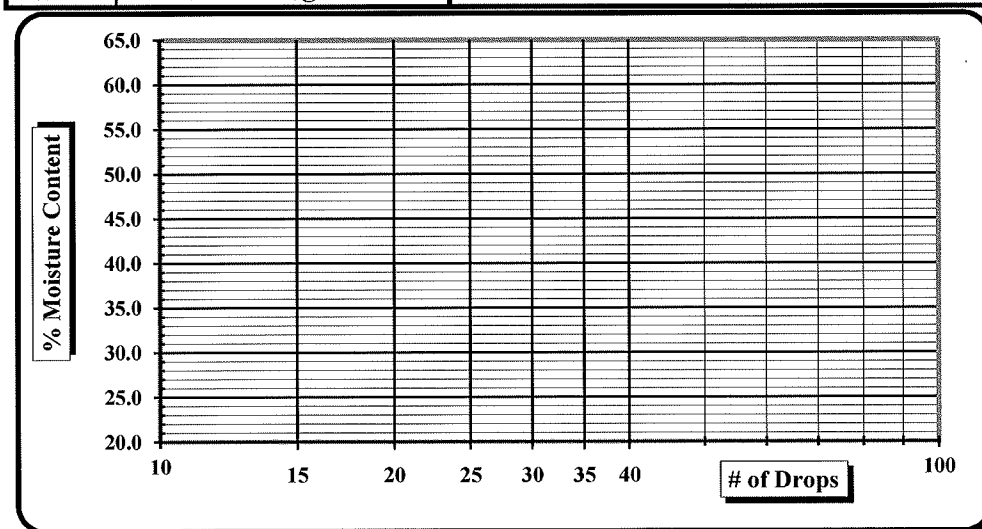


Quality Assurance

S&ME, Inc. ~9751 Southern Pine Boulevard, Charlotte, NC 28273

Project #:	1356-11-032 Phase 03	Report Date:	1/9/13
Project Name:	Marshall Industrial Landfill No. 1- Cells 3&4	Test Date(s)	12/13-17/12
Client Name:	Duke Energy		
Client Address:	526 South Church Street, Charlotte, NC 28202		
Boring #:	NA	Sample #:	SG-12
Location:	Cell 3&4 Subgrade	Offset:	NA
Elevation:	NA		
Sample Description:	Black Gray Silt (ML) Fly Ash		
Type and Specification	S&ME ID #	Cal Date:	Type and Specification
Balance (0.01 g)	3222	6/25/2012	Grooving tool
LL Apparatus	20230	6/26/2012	Grooving tool
Oven	10844	9/5/2012	Grooving tool

Pan #	Tare #:	Liquid Limit						Plastic Limit		
A	Tare Weight									
B	Wet Soil Weight + A									
C	Dry Soil Weight + A									
D	Water Weight (B-C)									
E	Dry Soil Weight (C-A)									
F	% Moisture (D/E)*100									
N	# OF DROPS							Moisture Contents determined by ASTM D 2216		
LL	LL = F * FACTOR									
Ave.	Average									



One Point Liquid Limit			
N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic ☒
 Liquid Limit
 Plastic Limit
 Plastic Index
 Group Symbol **ML**

Multipoint Method ☒
 One-point Method ☐

Wet Preparation ☐ Dry Preparation ☒ Air Dried ☒ Estimate the % Retained on the #40 Sieve:

Notes / Deviations / References:

Oven Temperature Set at 60C.

ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils

Karen Warner
 Technician Name

1/9/13
 Date

Kyle Baucom
 Technical Responsibility

1/9/13
 Date

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Particle Size Analysis of Soils



ASTM D 422

S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273

Report Date: 1/9/13

Project #: 1356-11-032 Phase 03

Project Name: Marshall Industrial Landfill No. 1 - Cells 3&4		Test Date(s): 12/13-18/12	
Client Name: Duke Energy		Address: 526 South Church Street, Charlotte, NC 28202	
Boring #: NA	Sample #: SG-12	Sample Date: 12/11/12	Sieve: 3.0"
Location: Cell 3 & 4 Subgrade	Offset: NA	Elevation: NA	Retained Wt. 0.0
Sample Description: Black Gray Silt (ML) Fly Ash			Pan # (washed) 100.0%
Pan #:	Beaker #:	Apparent Relative Density (Assumed) 2.200	1.0"
Hydrometer Jar #:			0.0
Pan Tare Weight (grams):			0.0
Total Sample Air Dried Wt. + tare wt. (grams):		Moisture Content	3/4"
Weight of Total Sample Air Dried:		Tare #	1/2"
Weight of Air Dried Hydrometer Sample (g):		A	3/8"
Total Sample Oven Dried:		B	#4
Hydrometer Sample Oven Dried (W):		C	#10
% Passing #10:		D	#20
Correction Factor a (Table 1):		E	#40
Description of Sand & Gravel Particles		% Moisture (100 x D/E)	#60
Stirring Apparatus: A			#100
Balance: ID No. 3222			#200
Cal. Date: 6/25/2012			
Control Cylinder			
Composite Correction			
Hydrometer			
Reading			
Temp. (0.5 °C)			
1			
2			
5			
15			
30			
60			
250			
1440			

Dispersed Time: 1 min. Sodium Hexametaphosphate: 40 g./ Liter

Hydrometer: ID No. 3901 Cal. Date: 3/25/2012

Type: 151H 152H

Time	Temp.	Hydrometer	Reading	Control Cylinder	Composite Correction	Rounded	Angular	Hard & Durable	Soft	Weathered & Friable	Effective	Depth	Table 3	Diameter
Percent Passing														
P(-#10) = (R x a / W) x 100														
P x % Passing #10														
P (total) =														
K x ((L/T) ^{1/2})														
0.04964														
0.03596														
0.02361														
0.01473														
0.01073														
0.00779														
0.00388														
0.00165														

References / Comments / Deviations ASTM D 422, D 2487, D 4318

Karen Warner
Technician Name

NICET 117900
Certification #

Kyle Baucom
Technical Responsibility

Project Engineer
Position

1/9/13
Date

Particle Size Analysis of Soils

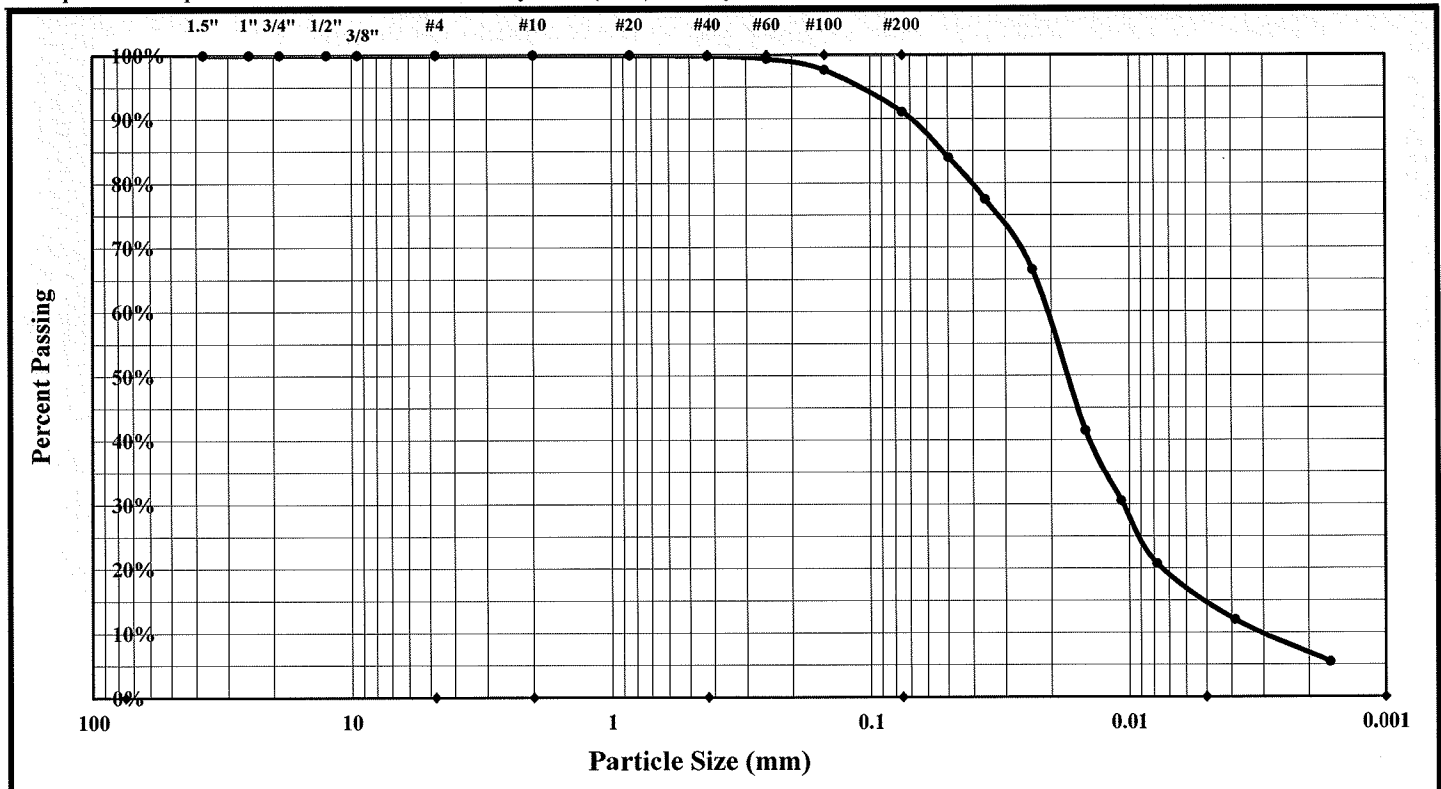


ASTM D422

Quality Assurance

S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273

S&ME Project #:	1356-11-032 Phase 03	Report Date:	1/9/13
Project Name:	Marshall Industrial Landfill No.1- Cells 3&4	Test Date(s):	12/13-18/12
Client Name:	Duke Energy		
Address:	526 South Church Street, Charlotte, NC 28202		
Boring #:	NA	Sample #:	SG-12
		Sample Date:	12/11/12
Location:	Cell 3 & 4 Subgrade	Offset:	NA
		Elevation:	NA
Sample Description:	Black Gray Silt (ML) Fly Ash		



Cobbles	< 300 mm (12") and > 75 mm (3")	Fine Sand	< 0.425 mm and > 0.075 mm (#200)
Gravel	< 75 mm and > 4.75 mm (#4)	Silt	< 0.075 and > 0.005 mm
Coarse Sand	< 4.75 mm and > 2.00 mm (#10)	Clay	< 0.005 mm
Medium Sand	< 2.00 mm and > 0.425 mm (#40)	Colloids	< 0.001 mm

Maximum Particle Size:	#20	Gravel:	0.0%	Silt	76.6%
Silt & Clay (% Passing #200):	91.1%	Total Sand:	8.9%	Clay	14.5%
Relative Density (Assumed)	2.200	Moisture Content	27.5%	Colloids	
Liquid Limit	NP	Plastic Limit	NP	Plastic Index	NP
Coarse Sand:	0.0%	Medium Sand:	0.1%	Fine Sand:	8.7%

Description of Sand and Gravel	Rounded <input type="checkbox"/>	Angular <input checked="" type="checkbox"/>	Hard & Durable <input checked="" type="checkbox"/>	Soft <input type="checkbox"/>	Weathered & Friable <input type="checkbox"/>
Mechanical Stirring Apparatus A	Dispersion Period:	1 min.	Dispersing Agent:	Sodium Hexametaphosphate:	40 g./ Liter

References / Comments / Deviations: ASTM D 4318, D 854, D 2487

Technician Name: Kyle Baucom Date: 1/9/13

Kyle Baucom
Technical Responsibility

Kyle Baucom
Signature

Project Engineer
Position

1/9/13
Date

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Moisture - Density Relationship



ASTM D558, D698, D1557, AASHTO T99, T180

Quality Assurance

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Project #:	1356-11-032 Phase 03			Report Date:	1/9/13
Project Name:	Marshall Industrial Landfill No.1 - Cells 3&4			Test Date(s)	12/13/12-1/9/13
Client Name:	Duke Energy				
Client Address:	526 South Church Street, Charlotte, NC 28202				
Boring #:	NA	Sample #:	SG-12	Sample Date:	12/11/2012
Location:	Cell 3&4	Offset:	NA	Depth:	NA
Sample Description:	Black Gray Silt (ML) Fly Ash				
Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #	Cal Date:
Balance (0.1 g)	22182	6/8/2012	Compaction Mold	20231	1/6/2012
Balance	22182	6/8/2012	Compaction Hammer	20222	6/6/2012
Straightedge	20179	8/7/2012	Oven	10844	5/9/2012
Sieve	22100	10/1/2012			

Water Content		Water Content requires GP 2 Balance (0.1 gram Readability).					Check:	
ASTM D2216 <input checked="" type="checkbox"/>		AASHTO T265 <input type="checkbox"/>		ASTM D4959 <input type="checkbox"/>		ASTM D4643 <input type="checkbox"/>		
Water Added:								
Tare #:		CJ	JLG	5K	AMRL	MJD		
A. Tare Weight	A.	156.8	162.4	154.1	163.1	160.0		
B. Wet Wt + Tare Wt	B.	898.4	878.0	827.8	945.4	902.2		
C. Dry Wt. + Tare Wt.	C.	771.5	739.3	687.4	766.6	726.6		
D. Water Weight	B-C	126.9	138.7	140.4	178.8	175.6		
E. Dry Weight	C-A	614.7	576.9	533.3	603.5	566.6		
F. Moisture Content	100*D/E	20.6%	24.0%	26.3%	29.6%	31.0%		
Compaction Data		Requires a GP 5 Balance for ASTM (1 gram or .0022 Lb. readability).					Check:	
ASTM D558 <input type="checkbox"/>		ASTM D 698 <input checked="" type="checkbox"/>		ASTM D1557 <input type="checkbox"/>		AASHTO T99 <input type="checkbox"/>		
Method A <input checked="" type="checkbox"/>		Method B <input type="checkbox"/>		Method C <input type="checkbox"/>		Method D (ASTM 1978) <input type="checkbox"/>		
AASHTO T180 <input type="checkbox"/>		AASHTO Method D <input type="checkbox"/>						
G. Wt of Soil + Mold	G.	5618	5680	5733	5724	5715		
H. Wt. of Mold	H.	4239	4239	4239	4239	4239		
I. Wt. of Soil (g. or lbs.)	G-H	1379	1441	1494	1485	1476		
J. Wt of Soil (Lbs.)	I/453.6 or I	3.040	3.177	3.294	3.274	3.254		
K. Mold Volume Factor	K.	30.09	30.09	30.09	30.09	30.09		
L. Wet Density (PCF)	J*K	91.5	95.6	99.1	98.5	97.9		
M. Dry Density (PCF)	L/(1+F)	75.9	77.1	78.5	76.0	74.7		
Sieve Size used to separate the Oversize Fraction:		#4 Sieve <input checked="" type="checkbox"/>		3/8 inch Sieve <input type="checkbox"/>		3/4 inch Sieve <input type="checkbox"/>		
Mechanical Rammer <input checked="" type="checkbox"/>		Manual Rammer <input type="checkbox"/>		Moist Preparation <input type="checkbox"/>		Dry Preparation <input checked="" type="checkbox"/>		

References / Comments / Deviations:

Oven Temperature Set At 60C.

Karen Warner

Technician Name

Signature

NICET 117900

Certification Type/No.

1/9/13
Date
 Kyle Baucom
 Technical Responsibility

Signature

 Project Engineer
 Position
1/9/13
Date

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Moisture - Density Report



Quality Assurance

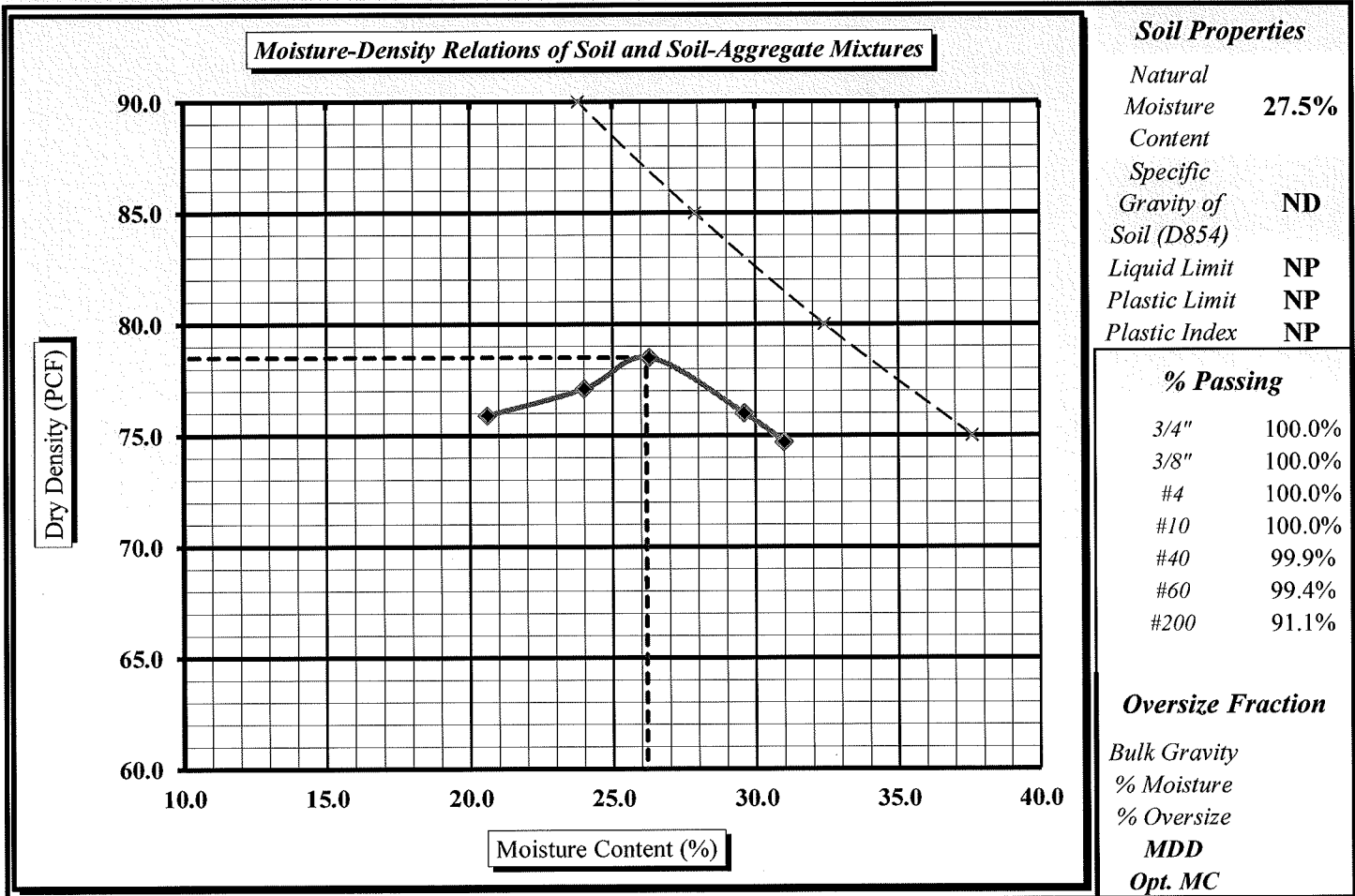
S&ME, Inc.~ 9751 Southern Pine Boulevard~Charlotte, NC 28273

S&ME Project #:	1356-11-032 Phase	Report Date:	1/9/13
Project Name:	Marshall Industrial Landfill No.1 - Cells 3&4	Test Date(s):	12/13/12-1/9/13
Client Name:	Duke Energy		
Client Address:	526 South Church Street, Charlotte, NC 28202		
Boring #:	NA	Sample #:	SG-12
Location:	Cell 3&4	Offset:	NA
Sample Description:	Black Gray Silt (ML) Fly Ash	Sample Date:	12/11/2012
		Depth:	NA

Maximum Dry Density 78.5 PCF.

Optimum Moisture Content 26.2%

ASTM D 698 -- Method A



Moisture-Density Curve Displayed: Fine Fraction ☒ Corrected for Oversize Fraction (ASTM D 4718) ☐
 Sieve Size used to separate the Oversize Fraction: #4 Sieve ☒ 3/8 inch Sieve ☐ 3/4 inch Sieve ☐
 Mechanical Rammer ☒ Manual Rammer ☐ Moist Preparation ☐ Dry Preparation ☒

References / Comments / Deviations: ASTM D 854: Specific Gravity of Soils

Technician Name: Karen Wadman

Date: 1/7/13

Kyle Bacon
Technical Responsibility

[Signature]
Signature

Project Engineer
Position

1/9/13
Date

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Particle Size Analysis of Soils

ASTM D 422



S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273

Project #: 1356-11-032 Phase 03

Report Date: 1/16/13

Project Name:		Marshall Industrial Landfill No.1 - Cells 3&4		Address: 526 South Church Street, Charlotte, NC 28202		Sieve		Retained Wt.		Percent Passing	
Client Name:		Duke Energy		Sample #: SG-13		Sample Date: 12/27/12		3.0"		0.0	
Boring #:		NA		Offset: NA		Elevation: NA		1.5"		0.0	
Location:		Grid C3		Fly Ash				1.0"		0.0	
Sample Description:		Black Gray Silt (ML)		Apparent Relative Density (Assumed)		2.200		3/4"		0.0	
Pan #:		Beaker #:						1/2"		0.0	
Hydrometer Jar #:											
Pan Tare Weight (grams):				Moisture Content		Hygroscopic		3/8"		0.0	
Total Sample Air Dried Wt. + tare wt. (grams):		332.94		Tare #		50		#4		0.0	
Weight of Total Sample Air Dried:		332.94		Tare Wt.		15.78		#10		0.00	
Weight of Air Dried Hydrometer Sample (g):		50.00		Wet Wt. + A		27.25		#20		0.02	
Total Sample Oven Dried:		307.69		Dry Wt. + A		26.38		#40		0.04	
Hydrometer Sample Oven Dried (W):		46.21		Water Wt. (B-C)		0.87		#60		0.29	
% Passing #10:		100.0%		Dry Wt. (C-A)		10.60		#100		1.04	
Correction Factor a (Table 1):		1.09		% Moisture (100 x D/E)		8.21%		#200		3.93	

Description of Sand & Gravel Particles ☒ Rounded ☐ Angular ☒ Hard & Durable ☒ Soft ☐ Weathered & Friable ☐Stirring Apparatus: A ☒ B ☐ Dispersion Time: 1 min. Sodium Hexametaphosphate: 40 g./ Liter

Balance: ID No. 3222 Cal. Date: 6/25/2012 Hydrometer: ID No. 3901 Cal. Date: 3/25/2012

Control Cylinder ☒ Composite Correction ☐ Type: 151H ☐ 152H ☒

Time	Temp. (0.5 °C)	Hydrometer Reading	Corrections		Hydrometer R	Percent Passing		Effective Depth L	Table 3		Diameter D = $K \times (L/T)^{1/2}$
			Control Cylinder	Composite Correction		P(-#10) = $(R \times a / W) \times 100$	P (total) = P x % Passing #10		L	K	
1	23.0	40.5	4.5		36.00	84.9%	84.9%	10.4	0.01544		0.04978
2	23.0	37.0	4.5		32.50	76.7%	76.7%	11.0	0.01544		0.03616
5	23.0	28.0	4.5		23.50	55.4%	55.4%	12.4	0.01544		0.02436
15	23.0	20.0	4.5		15.50	36.6%	36.6%	13.8	0.01544		0.01479
30	23.0	17.0	4.5		12.50	29.5%	29.5%	14.2	0.01544		0.01064
60	23.0	13.0	4.5		8.50	20.1%	20.1%	14.9	0.01544		0.00770
250	23.0	8.5	4.5		4.00	9.4%	9.4%	15.6	0.01544		0.00386
1440	23.0	6.5	4.5		2.00	4.7%	4.7%	16.0	0.01544		0.00163

References / Comments / Deviations ASTM D 422, D 2487, D 4318

Oven Temperature Set at 60C.

Karen Warner

Technician Name

NICET 117900

Certification #

Kyle Baucom

Technical Responsibility

Project Engineer

Position

1/16/13

Date

Particle Size Analysis of Soils

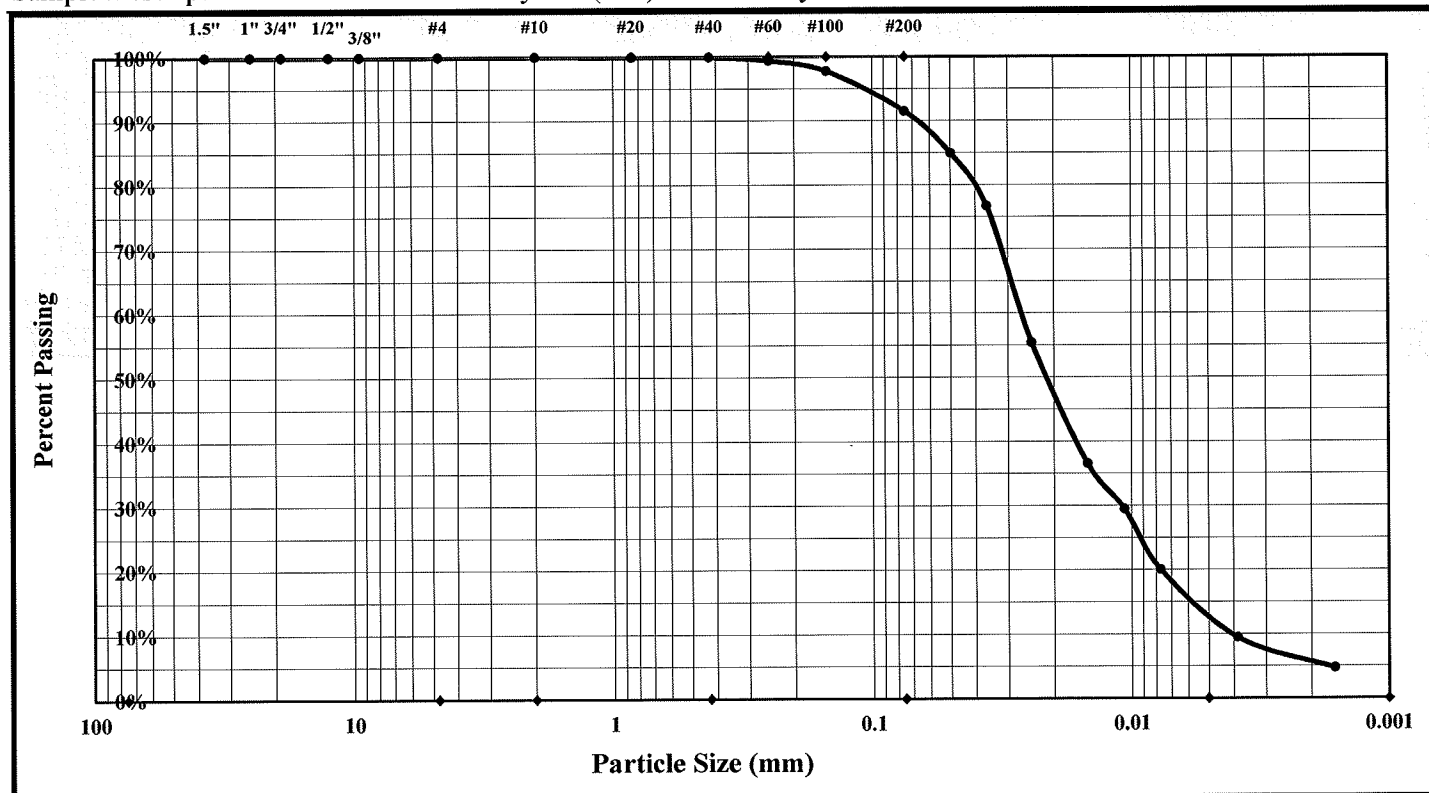


ASTM D422

Quality Assurance

S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273

S&ME Project #:	1356-11-032 Phase 03	Report Date:	1/16/13
Project Name:	Marshall Industrial Landfill No.1 - Cells 3&4	Test Date(s):	1/8-16/13
Client Name:	Duke Energy		
Address:	526 South Church Street, Charlotte, NC 28202		
Boring #:	NA	Sample #:	SG-13
		Sample Date:	12/27/12
Location:	Grid C3	Offset:	NA
		Elevation:	NA
Sample Description:	Black Gray Silt (ML)	Fly Ash	



Cobbles	< 300 mm (12") and > 75 mm (3")	Fine Sand	< 0.425 mm and > 0.075 mm (#200)
Gravel	< 75 mm and > 4.75 mm (#4)	Silt	< 0.075 and > 0.005 mm
Coarse Sand	< 4.75 mm and > 2.00 mm (#10)	Clay	< 0.005 mm
Medium Sand	< 2.00 mm and > 0.425 mm (#40)	Colloids	< 0.001 mm

Maximum Particle Size:	#20	Gravel:	0.0%	Silt	78.5%
Silt & Clay (% Passing #200):	91.5%	Total Sand:	8.5%	Clay	13.0%
Relative Density (Assumed)	2.200	Moisture Content	16.5%	Colloids	
Liquid Limit	NP	Plastic Limit	NP	Plastic Index	NP
Coarse Sand:	0.0%	Medium Sand:	0.1%	Fine Sand:	8.4%

Description of Sand and Gravel	Rounded <input type="checkbox"/>	Angular <input checked="" type="checkbox"/>	Hard & Durable <input checked="" type="checkbox"/>	Soft <input type="checkbox"/>	Weathered & Friable <input type="checkbox"/>
Mechanical Stirring Apparatus A	Dispersion Period:	1 min.	Dispersing Agent:	Sodium Hexametaphosphate:	40 g./ Liter

References / Comments: Deviations: ASTM D 4318, D 854, D 2487

Technician Name: Kyle Baucom Date: 1/14/13

Kyle Baucom
Technical Responsibility

[Signature]
Signature

Project Engineer
Position

1/16/13
Date

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Laboratory Determination of Water Content



ASTM D 2216



AASHTO T 265



Quality Assurance

S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273

Project #:	1356-11-032 Phase 03	Report Date:	1/16/13
Project Name:	Marshall Industrial Landfill No.1 - Cells 3 & 4	Test Date(s):	1/8-16/13
Client Name:	Duke Energy		
Client Address:	526 South Church Street, Charlotte, NC 28202		
Sample by:	Kyle Baucom	Sample Date(s):	12/27/12
Sampling Method:	NA	Drill Rig :	NA

Method:	A (1%)	<input type="checkbox"/>	B (0.1%)	<input checked="" type="checkbox"/>	<i>Balance ID.</i>	3222	<i>Calibration Date:</i>	6/25/12
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[illegible]

Notes / Deviations / References

Oven Temperature Set at 60C.

ASTM D 2216: Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass

Karen Warner
Technician Name

Robert J. Miller
Signature

NICET 117900
Certification Type / No.

1/16/13
Date

Kyle Baucom
Technical Responsibility


Signature

Project Engineer
Position

1/16/13
Date

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Liquid Limit, Plastic Limit, and Plastic Index



S&ME, Inc. ~9751 Southern Pine Boulevard, Charlotte, NC 28273

Project #: 1356-11-032 Phase 03

Report Date: 1/16/13

Project Name: Marshall Industrial Landfill No. 1- Cells 3&4

Test Date(s) 1/8-16/13

Client Name: Duke Energy

Client Address: 526 South Church Street, Charlotte, NC 28202

Boring #: NA

Sample #: SG-13

Sample Date: 12/27/12

Location: Cell 3&4 Subgrade

Offset: NA

Elevation: NA

Sample Description: Black Gray Silt (ML) Fly Ash

Type and Specification

S&ME ID #

Cal Date:

Type and Specification

S&ME ID #

Cal Date:

Balance (0.01 g)

3222

6/25/2012

Grooving tool

20837

10/29/2012

LL Apparatus

20230

6/26/2012

Grooving tool

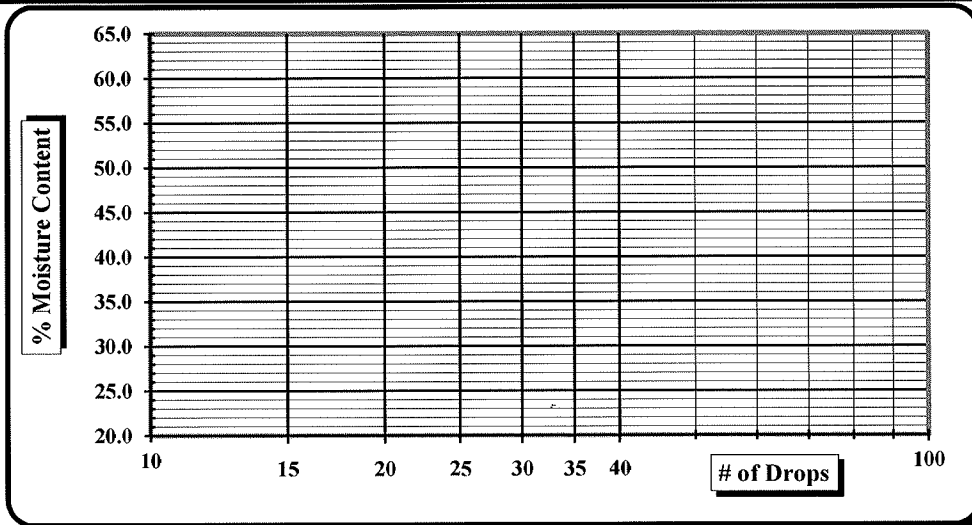
Oven

10844

9/5/2012

Grooving tool

Pan #		Liquid Limit						Plastic Limit		
Tare #:										
A	Tare Weight									
B	Wet Soil Weight + A									
C	Dry Soil Weight + A									
D	Water Weight (B-C)									
E	Dry Soil Weight (C-A)									
F	% Moisture (D/E)*100									
N	# OF DROPS							Moisture Contents determined by ASTM D 2216		
LL	LL = F * FACTOR									
Ave.	Average									



One Point Liquid Limit			
N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic ☒

Liquid Limit

Plastic Limit

Plastic Index

Group Symbol ML

Multipoint Method ☒One-point Method ☐Wet Preparation ☐Dry Preparation ☒Air Dried ☒

Estimate the % Retained on the #40 Sieve:

Notes / Deviations / References:

Oven Temperature Set at 60C.

ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils

Karen Warner

Technician Name

1/16/13

Date

Kyle Baucom

Technical Responsibility

1/16/13

Date

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Moisture - Density Report



Quality Assurance

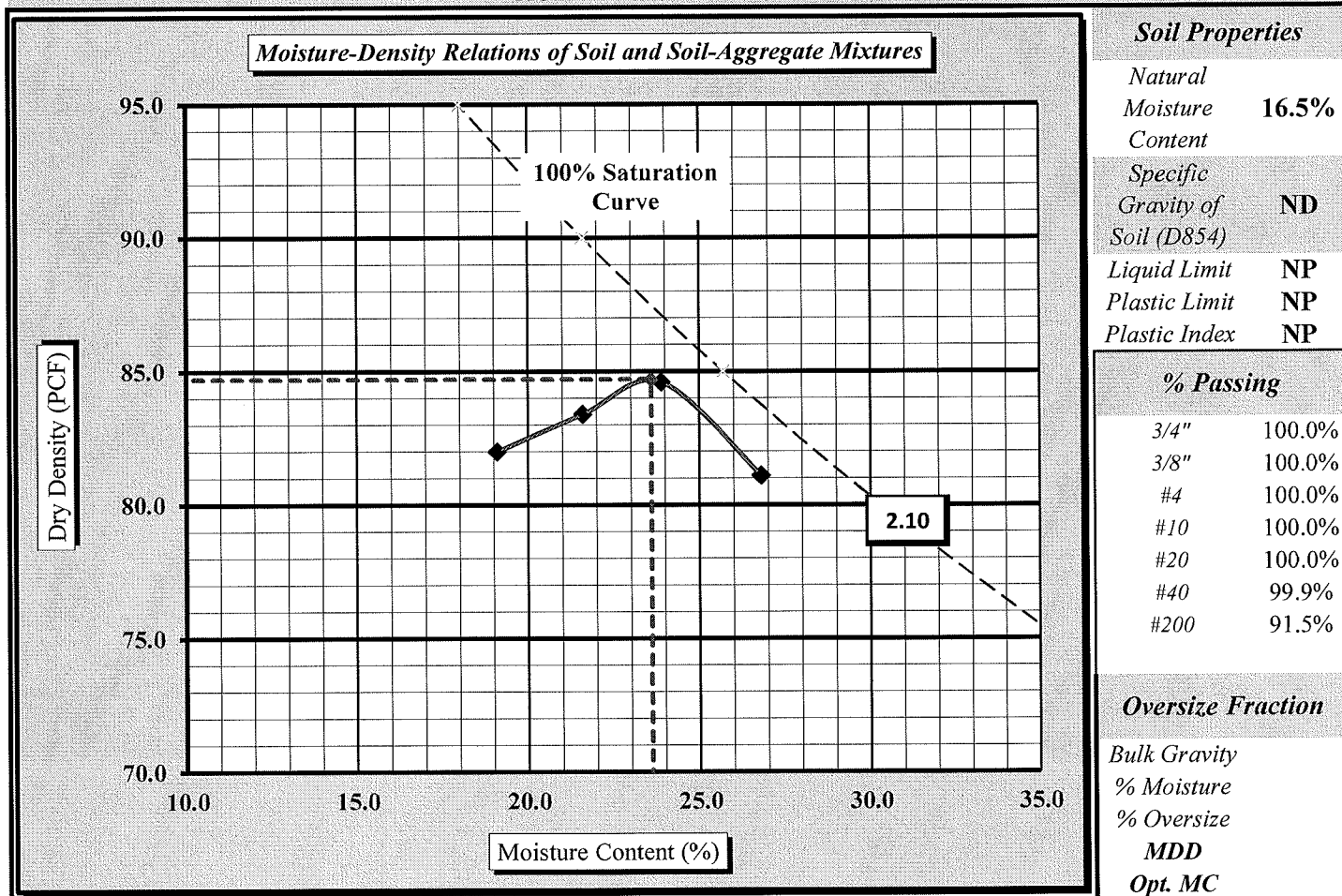
S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273

S&ME Project #:	1356-11-032	Phase 03	Report Date:	2/18/13	
Project Name:	Marshall Industrial Landfill No. 1 - Cells 3 & 4		Test Date(s):	2/15-18/13	
Client Name:	Duke Energy				
Client Address:	526 South Church Street, Charlotte, NC 28202				
Boring #:	NI	Sample #:	SG-13	Sample Date:	12/27/2012
Location:	Grid C3	Offset:	NI	Depth:	NI
Sample Description:	Black Gray Silt (ML) Fly Ash				

Maximum Dry Density 84.7 PCF.

Optimum Moisture Content 23.6%

ASTM D 698 -- Method A



Moisture-Density Curve Displayed: Fine Fraction ☒ Corrected for Oversize Fraction (ASTM D 4718) ☐
 Sieve Size used to separate the Oversize Fraction: #4 Sieve ☒ 3/8 inch Sieve ☐ 3/4 inch Sieve ☐
 Mechanical Rammer ☒ Manual Rammer ☐ Moist Preparation ☐ Dry Preparation ☒

References / Comments / Deviations: ND = Not determined NI = Information was not provided

Technician: Jennifer Olsen *Jennifer Olsen* Date: 2/18/13

ASTM D 2216: Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass

ASTM D 698: Laboratory Compaction Characteristics of Soil Using Standard Effort

Kyle Baucom

Technical Responsibility

Signature

Project Engineer

Position

Date

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Moisture - Density Relationship



ASTM D558, D698, D1557, AASHTO T99, T180

Quality Assurance

S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273

Project #:	1356-11-032	Phase 03	Report Date:	2/18/13
Project Name:	Marshall Industrial Landfill No. 1 - Cells 3 & 4		Test Date(s)	2/15-18/13
Client Name:	Duke Energy			
Client Address:	526 South Church Street, Charlotte, NC 28202			
Boring #:	NI	Sample #:	SG-13	Sample Date:
Location:	Grid C3	Offset:	NI	Depth:
Sample Description:	Black Gray Silt (ML) Fly Ash			

Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #	Cal Date:
Balance (0.1 g)	22182	6/8/2012	Compaction Mold	20116	2/4/2013
Balance	22182	6/8/2012	Compaction Hammer	20222	6/6/2012
Straightedge	27711	2/11/2013	Oven	22151	11/20/2012
Sieve #4	10939	10/1/2012			

Water Content		Water Content requires GP 2 Balance (0.1 gram Readability).				Check:	
ASTM D2216 <input checked="" type="checkbox"/>		AASHTO T265 <input type="checkbox"/>		ASTM D4959 <input type="checkbox"/>		ASTM D4643 <input type="checkbox"/>	
	Water Added:	350	400	300	250		
	Tare #:	JLG	18	691	DMJ		
A. Tare Weight	A.	162.2	156.6	157.3	164.0		
B. Wet Wt + Tare Wt	B.	1012.5	951.1	1184.1	1094.6		
C. Dry Wt. + Tare Wt.	C.	848.5	783.4	1001.5	945.6		
D. Water Weight	B-C	164.0	167.7	182.6	149.0		
E. Dry Weight	C-A	686.3	626.8	844.2	781.6		
F. Moisture Content	100*D/E	23.9%	26.8%	21.6%	19.1%		

Compaction Data		Requires a GP 5 Balance for ASTM (1 gram or .0022 Lb. readability).				Check:	
ASTM D558 <input type="checkbox"/>		ASTM D 698 <input checked="" type="checkbox"/>		ASTM D1557 <input type="checkbox"/>		AASHTO T99 <input type="checkbox"/>	
Method A <input checked="" type="checkbox"/>		Method B <input type="checkbox"/>		Method C <input type="checkbox"/>		Method D (ASTM 1978) <input type="checkbox"/>	
						AASHTO T180 <input type="checkbox"/>	
						AASHTO Method D <input type="checkbox"/>	
G. Wt of Soil + Mold	G.	5866	5836	5815	5759		
H. Wt. of Mold	H.	4283	4283	4283	4283		
I. Wt. of Soil (g. or lbs.)	G-H	1583	1553	1532	1476		
J. Wt of Soil (Lbs.)	I/453.6 or I	3.490	3.424	3.377	3.254		
K. Mold Volume Factor	K.	30.02	30.02	30.02	30.02		
L. Wet Density (PCF)	J*K	104.8	102.8	101.4	97.7		
M. Dry Density (PCF)	L/(1+F)	84.6	81.1	83.4	82.0		
Sieve Size used to separate the Oversize Fraction:		#4 Sieve <input checked="" type="checkbox"/>		3/8 inch Sieve <input type="checkbox"/>		3/4 inch Sieve <input type="checkbox"/>	
Mechanical Rammer <input checked="" type="checkbox"/>		Manual Rammer <input type="checkbox"/>		Moist Preparation <input type="checkbox"/>		Dry Preparation <input checked="" type="checkbox"/>	

References / Comments / Deviations:

*ND = Not determined *NI = Information was not provided

Jennifer Olsen
Technician Name

Jennifer Olsen
Signature

NICET/117926
Certification Type/No.

2/18/2013
Date

Kyle Baucom
Technical Responsibility

Kyle Baucom
Signature

Project Engineer
Position

2/19/13
Date

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Moisture - Density Relationship



ASTM D558, D698, D1557, AASHTO T99, T180

Quality Assurance

S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273

Project #:	1356-11-032	Phase 03	Report Date:	3/4/13
Project Name:	Marshall Industrial Landfill No. 1 - Cells 3 & 4		Test Date(s)	2/25-27/13
Client Name:	Duke Energy			
Client Address:	526 South Church Street, Charlotte, NC 28202			
Boring #:	NI	Sample #:	SG-14	Sample Date:
Location:	Cell 3&4 Structural Fill	Offset:	NI	Depth:
Sample Description:	Gray Black Silt (ML) Fly Ash			
Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #
Balance (0.1 g)	22182	6/8/2012	Compaction Mold	20116
Balance	22182	6/8/2012	Compaction Hammer	20222
Straightedge	27711	2/11/2013	Oven	
Sieve #4	10939	10/1/2012		

Water Content		Water Content requires GP 2 Balance (0.1 gram Readability).					Check:		
ASTM D2216 <input checked="" type="checkbox"/>		AASHTO T265 <input type="checkbox"/>		ASTM D4959 <input type="checkbox"/>		ASTM D4643 <input type="checkbox"/>			
Water Added:		150	100	200	50	250			
Tare #:		JMD	5C	SR	5L	5A			
A. Tare Weight	A.	164.4	156.7	163.5	156.1	160.0			
B. Wet Wt + Tare Wt	B.	968.9	1067.5	1059.6	1089.8	2019.3			
C. Dry Wt. + Tare Wt.	C.	824.1	919.5	882.2	957.2	1612.4			
D. Water Weight	B-C	144.8	148.0	177.4	132.6	406.9			
E. Dry Weight	C-A	659.7	762.8	718.7	801.1	1452.4			
F. Moisture Content	100*D/E	21.9%	19.4%	24.7%	16.6%	28.0%			
Compaction Data		Requires a GP 5 Balance for ASTM (1 gram or .0022 Lb. readability).					Check:		
ASTM D558 <input type="checkbox"/>		ASTM D 698 <input checked="" type="checkbox"/>		ASTM D1557 <input type="checkbox"/>		AASHTO T99 <input type="checkbox"/>		AASHTO T180 <input type="checkbox"/>	
Method A <input checked="" type="checkbox"/>		Method B <input type="checkbox"/>		Method C <input type="checkbox"/>		Method D (ASTM 1978) <input type="checkbox"/>		AASHTO Method D <input type="checkbox"/>	
G. Wt of Soil + Mold	G.	5916	5855	5888	5787	5896			
H. Wt. of Mold	H.	4282	4282	4282	4282	4282			
I. Wt. of Soil (g. or lbs.)	G-H	1634	1573	1606	1505	1614			
J. Wt of Soil (Lbs.)	1/453.6 or 1	3.602	3.468	3.541	3.318	3.558			
K. Mold Volume Factor	K.	30.02	30.02	30.02	30.02	30.02			
L. Wet Density (PCF)	J*K	108.1	104.1	106.3	99.6	106.8			
M. Dry Density (PCF)	L/(1+F)	88.7	87.2	85.2	85.4	83.4			
Sieve Size used to separate the Oversize Fraction:		#4 Sieve <input checked="" type="checkbox"/>		3/8 inch Sieve <input type="checkbox"/>		3/4 inch Sieve <input type="checkbox"/>			
Mechanical Rammer <input checked="" type="checkbox"/>		Manual Rammer <input type="checkbox"/>		Moist Preparation <input type="checkbox"/>		Dry Preparation <input checked="" type="checkbox"/>			
References / Comments / Deviations: *ND = Not determined *NI = Information was not provided									

Jennifer Olsen
Technician Name

Jennifer Olsen
Signature

NI/ET/117926 (KE)
Certification Type/No.

3/4/13
Date

Kyle Baucom
Technical Responsibility

Kyle Baucom
Signature

Project Engineer
Position

3/6/13
Date

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Moisture - Density Report



Quality Assurance

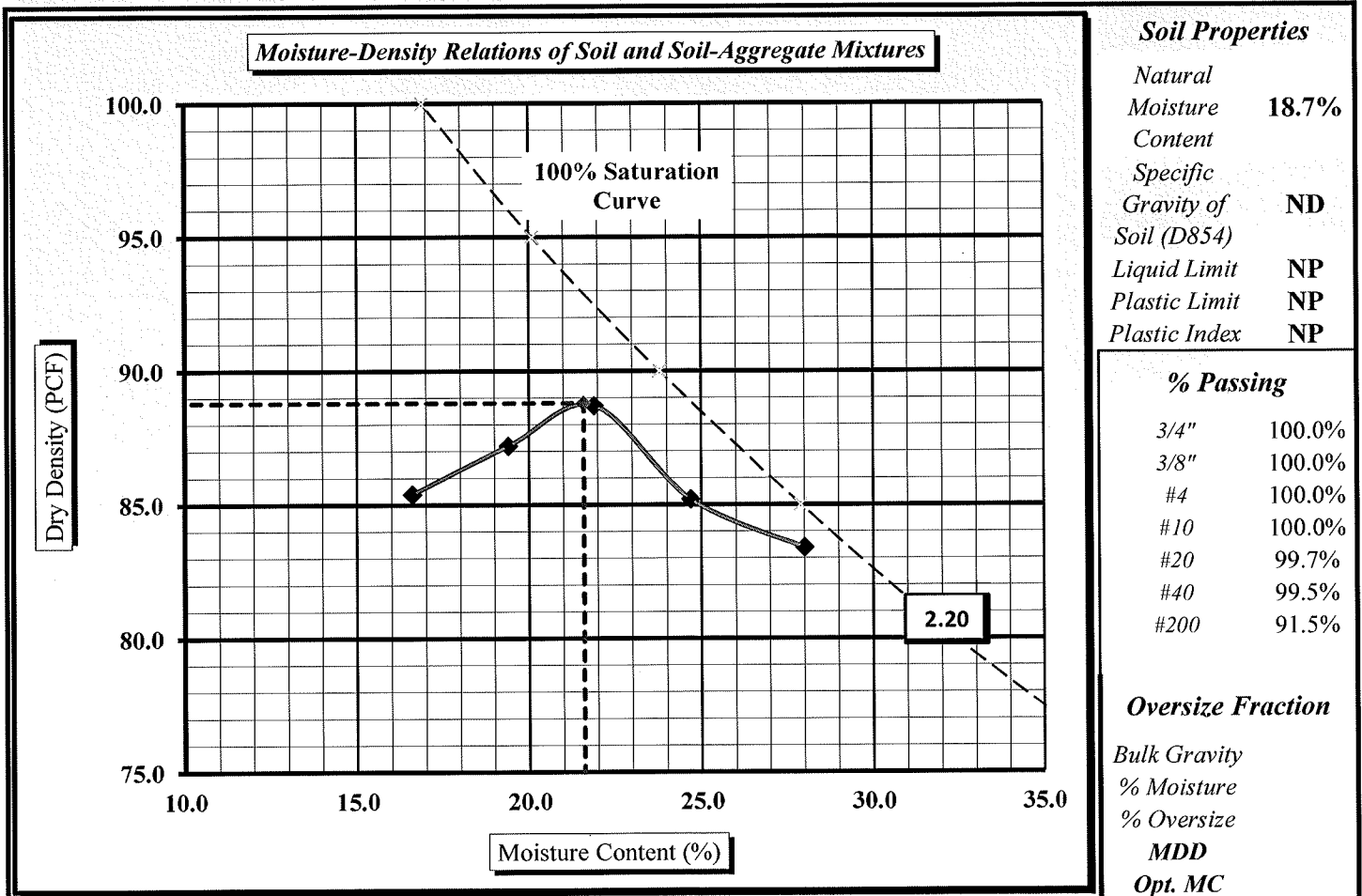
S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273

S&ME Project #:	1356-11-032	Phase 03	Report Date:	3/4/13	
Project Name:	Marshall Industrial Landfill No. 1 - Cells 3 & 4		Test Date(s):	2/25-27/13	
Client Name:	Duke Energy				
Client Address:	526 South Church Street, Charlotte, NC 28202				
Boring #:	NI	Sample #:	SG-14	Sample Date:	1/31/2013
Location:	Cell 3&4 Structural Fill	Offset:	NI	Depth:	NI
Sample Description:	Gray Black Silt (ML) Fly Ash				

Maximum Dry Density 88.8 PCF.

Optimum Moisture Content 21.6%

ASTM D 698 -- Method A



Moisture-Density Curve Displayed: Fine Fraction ☒ Corrected for Oversize Fraction (ASTM D 4718) ☐
 Sieve Size used to separate the Oversize Fraction: #4 Sieve ☒ 3/8 inch Sieve ☐ 3/4 inch Sieve ☐
 Mechanical Rammer ☒ Manual Rammer ☐ Moist Preparation ☐ Dry Preparation ☒

References / Comments / Deviations: ND = Not determined NI = Information was not provided
 Technician: Jennifer Olsen *Jennifer Olsen* Date: 3/4/13
 ASTM D 2216: Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
 ASTM D 698: Laboratory Compaction Characteristics of Soil Using Standard Effort

Kyle Baucom
 Technical Responsibility

[Signature]
 Signature

Project Engineer
 Position

3/6/13
 Date

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Liquid Limit, Plastic Limit, and Plastic Index

S&ME, Inc. ~9751 Southern Pine Boulevard, Charlotte, NC 28273

Project #: 1356-11-032 Phase 03

Report Date: 3/4/13

Project Name: Marshall Industrial Landfill No. 1 - Cells # &4

Test Date(s) 2/6-3/4/13

Client Name: Duke Energy

Client Address: 526 South Church Street, Charlotte, NC 28202

Boring #: NA

Sample #: SG-14

Sample Date: 1/31/13

Location: Cell 3 & 4 Structural Fill

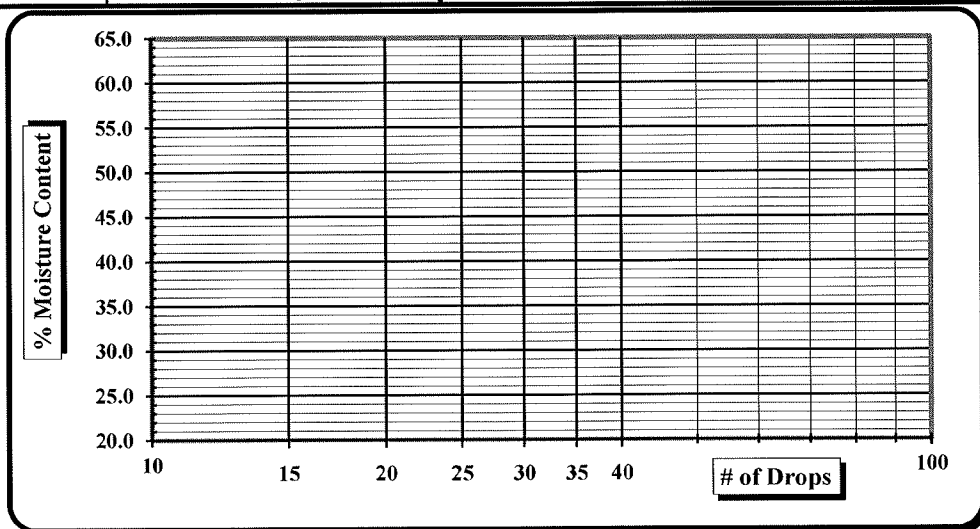
Offset: NA

Elevation: NA

Sample Description: Gray Black Silt (ML) Fly Ash

Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #	Cal Date:
Balance (0.01 g)	3222	6/24/2012	Grooving tool	27704	2/14/2013
LL Apparatus	20230	6/26/2012	Grooving tool		
Oven	10844	2/4/2013	Grooving tool		

Pan #	Tare #:	Liquid Limit					Plastic Limit		
A	Tare Weight								
B	Wet Soil Weight + A								
C	Dry Soil Weight + A								
D	Water Weight (B-C)								
E	Dry Soil Weight (C-A)								
F	% Moisture (D/E)*100								
N	# OF DROPS						Moisture Contents determined by ASTM D 2216		
LL	LL = F * FACTOR								
Ave.	Average								



One Point Liquid Limit			
N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic ☒

Liquid Limit

Plastic Limit

Plastic Index

Group Symbol ML

Multipoint Method ☒One-point Method ☐Wet Preparation ☐Dry Preparation ☒Air Dried ☒

Estimate the % Retained on the #40 Sieve:

Notes / Deviations / References:

Oven Temperature Set at 60 C.

ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils

Karen Warner

Technician Name

Date

Kyle Baucom

Technical Responsibility

Date

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Particle Size Analysis of Soils



ASTM D 422

S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273

Project #: 1356-11-032 Phase 03

Report Date: 3/4/13

Project Name: Marshall Industrial Landfill No.1 - Cells 3 & 4 Test Date(s): 2/26-3/4/13

Client Name:	Duke Energy	Address:	526 South Church Street, Charlotte, NC 28202	Sieve	Retained Wt.	Percent Passing
Boring #:	NA	Sample #:	SG-14	3.0"	0.0	100.0%
Location:	Cell 3 & 4 Structural Fill	Offset:	NA	1.5"	0.0	100.0%
Sample Description:	Gray Black Silt (ML)	Fly Ash		1.0"	0.0	100.0%
Pan #:		Beaker #:		3/4"	0.0	100.0%
Hydrometer Jar #:				1/2"	0.0	100.0%
Pan Tare Weight (grams):		Moisture Content	Hygroscopic	3/8"	0.0	100.0%
Total Sample Air Dried Wt. + tare wt. (grams):		Tare #	33	#4	0.0	100.0%
Weight of Total Sample Air Dried:		Tare Wt.	15.88	#10	0.09	100.0%
Weight of Air Dried Hydrometer Sample (g):		Wet Wt. + A	335.56	#20	0.12	99.7%
Total Sample Oven Dried:		Dry Wt. + A	295.55	#40	0.25	99.5%
Hydrometer Sample Oven Dried (W):		Water Wt. (B-C)	40.01	#60	0.47	99.1%
% Passing #10:		Dry Wt. (C-A)	213.67	#100	1.49	97.0%
Correction Factor a (Table 1):		% Moisture (100 x D/E)	0.20%	#200	4.25	91.5%

Description of Sand & Gravel Particles ☒ Rounded ☐ Angular ☒ Hard & Durable ☒ Soft ☐ Weathered & Friable ☐Stirring Apparatus: A ☒ B ☐ Dispersion Time: 1 min. Sodium Hexametaphosphate: 40 g./ Liter

Balance: ID No. 3222 Cal. Date: 6/25/2012 Hydrometer: ID No. 3901 Cal. Date: 3/25/2012

Control Cylinder ☒ Composite Correction ☐ Type: 151H ☐ 152H ☒

Time	Temp.	Hydrometer	Corrections		Hydrometer	Percent Passing		Effective	Table 3		Diameter
			Control	Composite		P(-#10) = (R x a / W) x 100	P x % Passing #10		Depth	K	
T (Min.)	(0.5 °C)	Reading	Cylinder	Correction	R			L			D = K x (L/T) ^{1/2}
1	21.5	44.0	5.0		39.00	85.1%	85.1%	9.9	0.01571		0.04944
2	21.5	40.5	5.0		35.50	77.5%	77.5%	10.5	0.01571		0.03596
5	21.5	33.0	5.0		28.00	61.1%	61.1%	11.7	0.01571		0.02404
15	21.5	22.5	5.0		17.50	38.2%	38.2%	13.4	0.01571		0.01487
30	21.5	16.5	5.0		11.50	25.1%	25.1%	14.4	0.01571		0.01089
60	22.0	14.5	5.0		9.50	20.7%	20.7%	14.7	0.01562		0.00774
250	22.0	10.0	5.0		5.00	10.9%	10.9%	15.5	0.01562		0.00389
1440	21.5	7.0	5.0		2.00	4.4%	4.4%	16.0	0.01571		0.00165

References / Comments / Deviations ASTM D 422, D 2487, D 4318

Oven Temperature Set at 60C.

Karen Warner
Technician Name

NICET 117900

Certification #

Kyle Baucom
Technical ResponsibilityProject Engineer
Position

S&ME, Inc. - Corporate

3201 Spring Forest Road
Raleigh, N.C. 276161356-11-032 Phase 03 SG-14 Hydro.xls
Page 1 of 13/6/13
Date

Particle Size Analysis of Soils

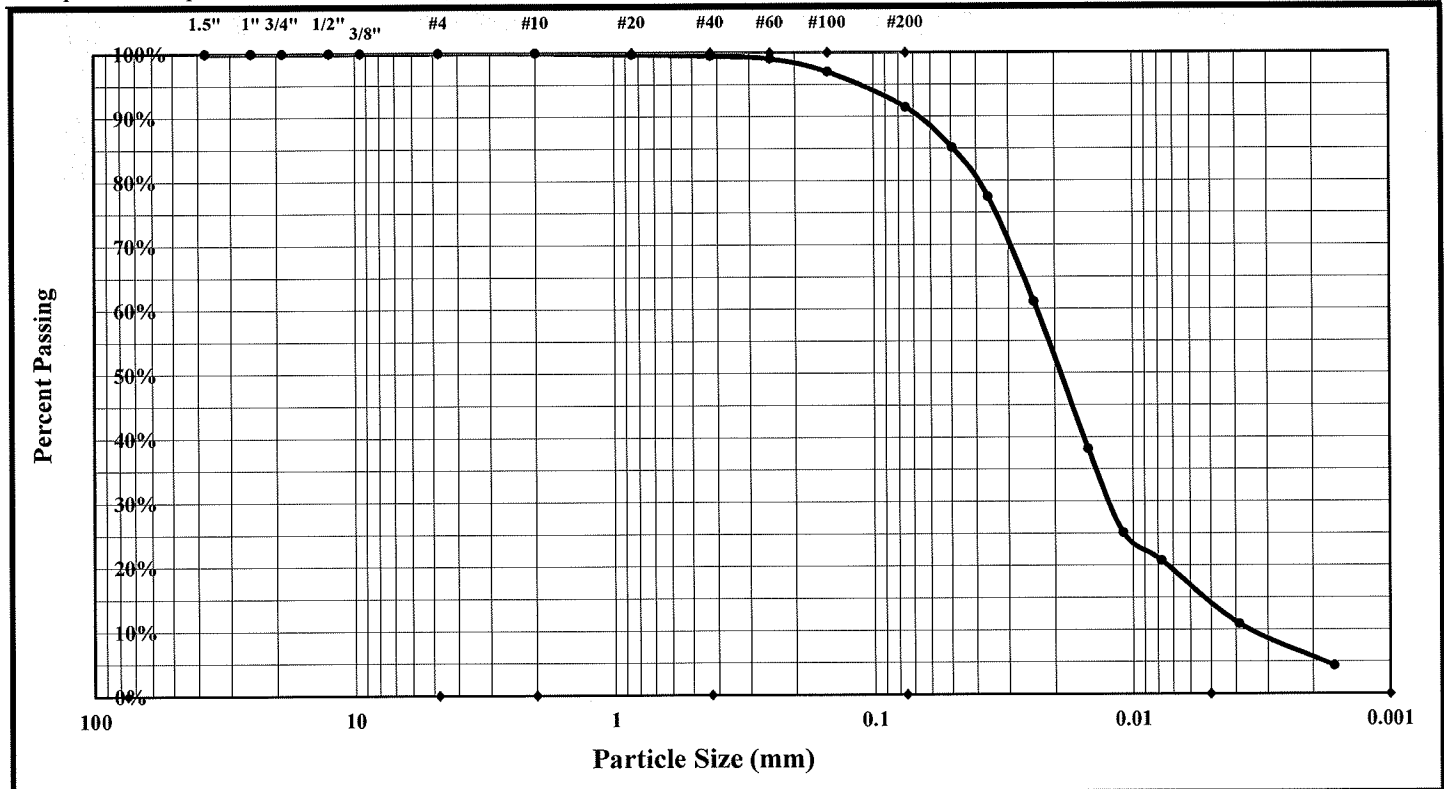


ASTM D422

Quality Assurance

S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273

S&ME Project #:	1356-11-032 Phase 03	Report Date:	3/4/13
Project Name:	Marshall Industrial Landfill No.1 - Cells 3 & 4	Test Date(s):	2/26-3/4/13
Client Name:	Duke Energy		
Address:	526 South Church Street, Charlotte, NC 28202		
Boring #:	NA	Sample #:	SG-14
		Sample Date:	1/31/13
Location:	Cell 3 & 4 Structural	Offset:	NA
		Elevation:	NA
Sample Description:	Gray Black Silt (ML)	Fly Ash	



Cobbles	< 300 mm (12") and > 75 mm (3")	Fine Sand	< 0.425 mm and > 0.075 mm (#200)
Gravel	< 75 mm and > 4.75 mm (#4)	Silt	< 0.075 and > 0.005 mm
Coarse Sand	< 4.75 mm and > 2.00 mm (#10)	Clay	< 0.005 mm
Medium Sand	< 2.00 mm and > 0.425 mm (#40)	Colloids	< 0.001 mm

Maximum Particle Size:	#10	Gravel:	0.0%	Silt	77.0%
Silt & Clay (% Passing #200):	91.5%	Total Sand:	8.5%	Clay	14.5%
Unit Relative Density (Assumed)	2.200	Moisture Content	18.7%	Colloids	
Liquid Limit	NP	Plastic Limit	NP	Plastic Index	NP
Coarse Sand:	0.0%	Medium Sand:	0.5%	Fine Sand:	8.0%
Description of Sand and Gravel	Rounded <input type="checkbox"/> Angular <input checked="" type="checkbox"/>	Hard & Durable <input checked="" type="checkbox"/> Soft <input type="checkbox"/>	Weathered & Friable <input type="checkbox"/>		
Mechanical Stirring Apparatus A	Dispersion Period:	1 min.	Dispersing Agent:	Sodium Hexametaphosphate:	40 g./ Liter
References / Comments / Deviations:	ASTM D 4318, D 854, D 2487 Oven Temperature Set at 60C.				
Technician Name:	Date:		3/4/13		

Kyle Baucom
Technical Responsibility

[Signature]
Signature

Project Engineer
Position

3/6/13
Date

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Moisture - Density Relationship



ASTM D558, D698, D1557, AASHTO T99, T180

Quality Assurance

S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273

Project #:	1356-11-032	Phase 03	Report Date:	3/22/13
Project Name:	Marshall Industrial Landfill No. 1 - Cells 3 & 4		Test Date(s)	3/6-8/13
Client Name:	Duke Energy			
Client Address:	526 South Church Street, Charlotte, NC 28202			
Boring #:	NI	Sample #:	SG-15	Sample Date:
Location:	Cell 3&4 Structural Fill	Offset:	NI	Depth:
Sample Description:	Black Gray Silt (ML)	Fly Ash		
Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #
Balance (0.1 g)	22182	6/8/2012	Compaction Mold	20116
Balance	22182	6/8/2012	Compaction Hammer	20222
Straightedge	27711	2/11/2013	Oven	22151
Sieve #4	10939	10/1/2012		

Water Content		Water Content requires GP 2 Balance (0.1 gram Readability).				Check:	
ASTM D2216 <input checked="" type="checkbox"/>		AASHTO T265 <input type="checkbox"/>		ASTM D4959 <input type="checkbox"/>		ASTM D4643 <input type="checkbox"/>	
Water Added:		200	250	300	350		
Tare #:		5L	MJD	KH	G		
A. Tare Weight	A.	156.4	160.0	158.8	158.7		
B. Wet Wt + Tare Wt	B.	1032.2	1152.1	1093.5	1050.3		
C. Dry Wt. + Tare Wt.	C.	910.0	991.5	931.3	878.3		
D. Water Weight	B-C	122.2	160.6	162.2	172.0		
E. Dry Weight	C-A	753.6	831.5	772.5	719.6		
F. Moisture Content	100*D/E	16.2%	19.3%	21.0%	23.9%		
Compaction Data		Requires a GP 5 Balance for ASTM (1 gram or .0022 Lb. readability).				Check:	
ASTM D558 <input type="checkbox"/>		ASTM D 698 <input checked="" type="checkbox"/>		ASTM D1557 <input type="checkbox"/>		AASHTO T99 <input type="checkbox"/>	
Method A <input checked="" type="checkbox"/>		Method B <input type="checkbox"/>		Method C <input type="checkbox"/>		Method D (ASTM 1978) <input type="checkbox"/>	
						AASHTO T180 <input type="checkbox"/>	
						AASHTO Method D <input type="checkbox"/>	
G. Wt of Soil + Mold	G.	5858	5929	5953	5930		
H. Wt. of Mold	H.	4282	4282	4282	4282		
I. Wt. of Soil (g. or lbs.)	G-H	1576	1647	1671	1648		
J. Wt of Soil (Lbs.)	I/453.6 or I	3.474	3.631	3.684	3.633		
K. Mold Volume Factor	K.	30.02	30.02	30.02	30.02		
L. Wet Density (PCF)	J*K	104.3	109.0	110.6	109.1		
M. Dry Density (PCF)	L/(1+F)	89.8	91.4	91.4	88.1		
Sieve Size used to separate the Oversize Fraction:		#4 Sieve <input checked="" type="checkbox"/>		3/8 inch Sieve <input type="checkbox"/>		3/4 inch Sieve <input type="checkbox"/>	
Mechanical Rammer <input checked="" type="checkbox"/>		Manual Rammer <input type="checkbox"/>		Moist Preparation <input type="checkbox"/>		Dry Preparation <input checked="" type="checkbox"/>	

References / Comments / Deviations: *ND = Not determined *NI = Information was not provided

Jennifer Olsen
Technician Name

Jennifer Olsen 3/22/13
Signature

MCET/117926 (KB)
Certification Type/No.

3/8/2013
Date

Kyle Baucom
Technical Responsibility

Kyle Baucom
Signature

Project Engineer
Position

3/25/13
Date

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Moisture - Density Report



Quality Assurance

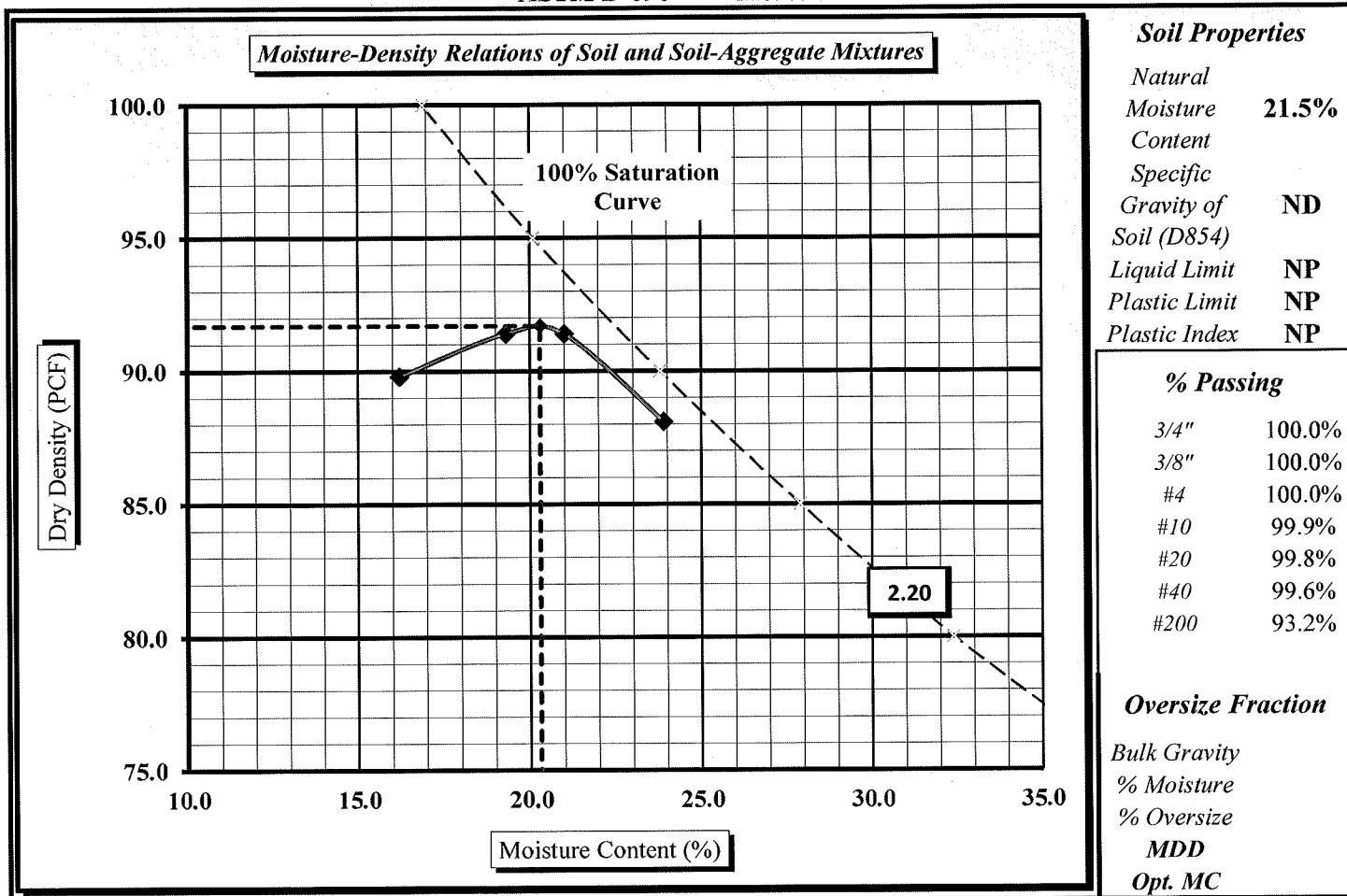
S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273

S&ME Project #:	1356-11-032	Phase 03	Report Date:	3/22/13	
Project Name:	Marshall Industrial Landfill No. 1 - Cells 3 & 4		Test Date(s):	3/6-8/13	
Client Name:	Duke Energy				
Client Address:	526 South Church Street, Charlotte, NC 28202				
Boring #:	NI	Sample #:	SG-15	Sample Date:	2/27/2013
Location:	Cell 3&4 Structural Fill	Offset:	NI	Depth:	NI
Sample Description:	Black Gray Silt (ML)	Fly Ash			

Maximum Dry Density 91.7 PCF.

Optimum Moisture Content 20.3%

ASTM D 698 -- Method A



Moisture-Density Curve Displayed: Fine Fraction ☒ Corrected for Oversize Fraction (ASTM D 4718) ☐
 Sieve Size used to separate the Oversize Fraction: #4 Sieve ☒ 3/8 inch Sieve ☐ 3/4 inch Sieve ☐
 Mechanical Rammer ☒ Manual Rammer ☐ Moist Preparation ☐ Dry Preparation ☒

References / Comments / Deviations: ND = Not determined NI = Information was not provided

Technician: Jennifer Olsen *Jennifer L Olsen 3/22/13* Date: 3/8/13

ASTM D 2216: Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass

ASTM D 698: Laboratory Compaction Characteristics of Soil Using Standard Effort

Kyle Baucom

Technical Responsibility

Signature

Position

Date

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Particle Size Analysis of Soils



ASTM D 422

S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273

Report Date: 3/21/13

Project #: 1356-11-032 Phase 03

Project Name: Marshall Industrial Landfill No. 1- Cells 3 & 4 Test Date(s): 2/30-3/5/13

Client Name: Duke Energy		Address: 526 South Church Street, Charlotte, NC 28292		Sieve	Retained Wt.	Percent Passing	
Boring #: NA	Sample #: SG-15	Sample Date: 2/27/13	Elevation: NA	3.0"	0.0	Pan #	100.0%
Location: Cell 3 & 4 Structural Fill	Offset: NA			1.5"	0.0	(washed)	100.0%
Sample Description: Gray Black Silt (ML)	Fly Ash			1.0"	0.0		100.0%
Pan #:	Beaker #:	Apparent Relative Density (Assumed)		3/4"	0.0		100.0%
Hydrometer Jar #:				1/2"	0.0		100.0%
Pan Tare Weight (grams):		Moisture Content		3/8"	0.0	Soil Mortar	100.0%
Total Sample Air Dried Wt. + tare wt. (grams):		Tare #		#4	0.0		100.0%
Weight of Total Sample Air Dried:		Tare Wt.		#10	0.63	100.0%	99.9%
Weight of Air Dried Hydrometer Sample (g):		Wet Wt. + A		#20	0.04		99.8%
Total Sample Oven Dried:		Dry Wt. + A		#40	0.11		99.6%
Hydrometer Sample Oven Dried (W):		Water Wt. (B-C)		#60	0.32		99.2%
% Passing #10:		Dry Wt. (C-A)		#100	1.04		97.8%
Correction Factor a (Table 1):		% Moisture (100 x D/E)		#200	3.32		93.2%
Description of Sand & Gravel Particles		Rounded	Angular	Hard & Durable	Soft	Weathered & Friable	
Stirring Apparatus: A		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Balance: ID No. 3222		Cal. Date: 6/25/2013	Dispersion Time: 1 min.	Sodium Hexametaphosphate: 40 g./ Liter	Cal. Date: 3/25/2012		
Control Cylinder		<input checked="" type="checkbox"/>	Composite Correction	Type: 151H	152H		

Time	Temp.	T (Min.)	Hydrometer		Corrections		Percent Passing		Effective		Diameter	
			Reading	Control Cylinder	Composite Correction	P(-#10) = (R x a / W) x 100	P (total) = P x % Passing #10	Depth	L	K	D = K x (L/T) ^{1/2}	
1	22.0	43.5	5.0	5.0	38.50	83.9%	83.8%	10.0	0.01562	0.04934		
2	22.0	41.0	5.0	5.0	36.00	78.5%	78.4%	10.4	0.01562	0.03560		
5	22.0	34.5	5.0	5.0	29.50	64.3%	64.2%	11.5	0.01562	0.02364		
15	22.0	26.0	5.0	5.0	21.00	45.8%	45.7%	12.9	0.01562	0.01446		
30	22.0	20.0	5.0	5.0	15.00	32.7%	32.7%	13.8	0.01562	0.01061		
60	22.0	15.0	5.0	5.0	10.00	21.8%	21.8%	14.7	0.01562	0.00772		
250	22.0	10.0	5.0	5.0	5.00	10.9%	10.9%	15.5	0.01562	0.00389		
1440	22.0	7.0	5.0	5.0	2.00	4.4%	4.4%	16.0	0.01562	0.00164		

References / Comments / Deviations ASTM D 422, D 2487, D 4318

Oven Temperature Set at 60C.

Karen Warner
Technician Name

NICET 117900
Certification #

Kyle Baucom
Technical Responsibility

Project Engineer
Position

Particle Size Analysis of Soils



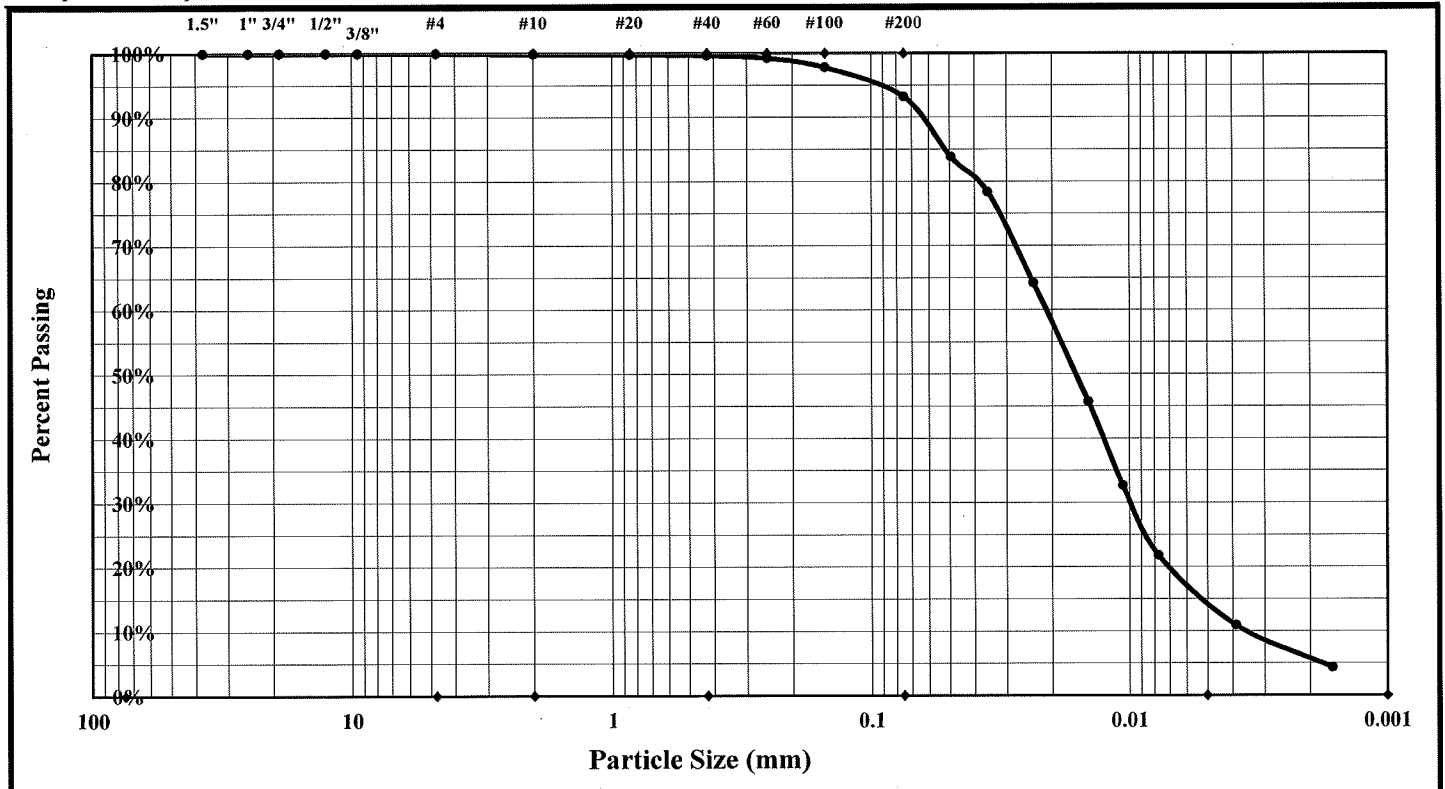
ASTM D422

Quality Assurance

S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273

S&ME Project #:	1356-11-032 Phase 03	Report Date:	3/21/13
Project Name:	Marshall Industrial Landfill No. 1- Cells 3 & 4	Test Date(s):	2/30-3/5/13
Client Name:	Duke Energy		
Address:	526 South Church Street, Charlotte, NC 28292		
Boring #:	NA	Sample #:	SG-15
		Sample Date:	2/27/13
Location:	Cell 3 & 4 Structural	Offset:	NA
		Elevation:	NA

Sample Description: Gray Black Silt (ML) Fly Ash



Cobbles	< 300 mm (12") and > 75 mm (3")	Fine Sand	< 0.425 mm and > 0.075 mm (#200)
Gravel	< 75 mm and > 4.75 mm (#4)	Silt	< 0.075 and > 0.005 mm
Coarse Sand	< 4.75 mm and > 2.00 mm (#10)	Clay	< 0.005 mm
Medium Sand	< 2.00 mm and > 0.425 mm (#40)	Colloids	< 0.001 mm

Maximum Particle Size:	#10	Gravel:	0.0%	Silt	78.7%
Silt & Clay (% Passing #200):	93.2%	Total Sand:	6.8%	Clay	14.5%
Relative Density (Assumed)	2.200	Moisture Content	21.5%	Colloids	
Liquid Limit	NP	Plastic Limit	NP	Plastic Index	NP
Coarse Sand:	0.1%	Medium Sand:	0.2%	Fine Sand:	6.4%
Description of Sand and Gravel	Rounded <input type="checkbox"/> Angular <input checked="" type="checkbox"/>	Hard & Durable <input checked="" type="checkbox"/> Soft <input type="checkbox"/>	Weathered & Friable <input type="checkbox"/>		
Mechanical Stirring Apparatus	A	Dispersion Period:	1 min.	Dispersing Agent:	Sodium Hexametaphosphate: 40 g./ Liter

References / Comments / Deviations: ASTM D 4318, D 854, D 2487

Technician Name: Kyle Baucom Date: 3/21/13

Kyle Baucom
Technical Responsibility

[Signature]
Signature

Project Engineer
Position

3/25/13
Date

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Liquid Limit, Plastic Limit, and Plastic Index

S&ME, Inc. ~9751 Southern Pine Boulevard, Charlotte, NC 28273

Project #: 1356-11-032 Phase 03

Report Date: 3/22/13

Project Name: Marshall Industrial Landfill No. 1-Cells 3 & 4

Test Date(s) 2/30-3/22/13

Client Name: Duke Energy

Client Address: 526 South Church Street, Charlotte, NC 28202

Boring #: NA

Sample #: SG-15

Sample Date: 2/27/13

Location: Cell 3&4 Structural Fill

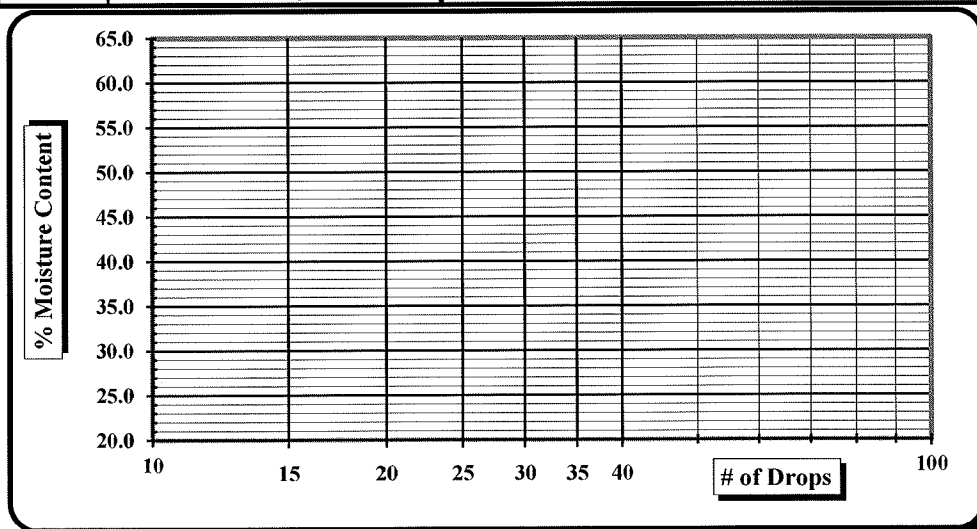
Offset: NA

Elevation: NA

Sample Description: Black Gray Silt (ML) Fly Ash

Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #	Cal Date:
Balance (0.01 g)	3222	6/25/2012	Grooving tool	27704	2/4/2013
LL Apparatus	3653	2/26/2013	Grooving tool		
Oven	10844	2/4/2013	Grooving tool		

Pan #	Tare #:	Liquid Limit						Plastic Limit		
A	Tare Weight									
B	Wet Soil Weight + A									
C	Dry Soil Weight + A									
D	Water Weight (B-C)									
E	Dry Soil Weight (C-A)									
F	% Moisture (D/E)*100									
N	# OF DROPS							Moisture Contents determined by ASTM D 2216		
LL	LL = F * FACTOR									
Ave.	Average									



One Point Liquid Limit			
N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic ☒

Liquid Limit

Plastic Limit

Plastic Index

Group Symbol ML

Multipoint Method ☒One-point Method ☐Wet Preparation ☐Dry Preparation ☒Air Dried ☒

Estimate the % Retained on the #40 Sieve:

Notes / Deviations / References:

Oven Temperature Set at 60C.

ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils

Karen Warner

Technician Name

3/22/13
Date

Kyle Baucom

Technical Responsibility

3/25/13
Date

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Particle Size Analysis of Soils

ASTM D 422



S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273

Report Date: 4/2/13

Project #: 1356-11-032 Phase 03

Project Name: Marshall Industrial Landfill No.1 - Cells 3 & 4 Test Date(s): 3/19-4/2/13

Client Name:	Duke Energy	Address:	526 South Church Street, Charlotte, NC 28202	Sieve	Retained Wt.	Percent Passing
Boring #:	NA	Sample #:	SG-16	3.0"	0.0	100.0%
Location:	Cell 3&4 Structural Fill	Offset:	NA	1.5"	0.0	100.0%
Sample Description:	Black Gray Silt (ML) Fly Ash	Elevation:	NA	1.0"	0.0	100.0%
Pan #:		Beaker #:		3/4"	0.0	100.0%
Hydrometer Jar #:		Apparent Relative Density (Assumed)	2.200	1/2"	0.0	100.0%
Pan Tare Weight (grams):		Moisture Content		3/8"	0.0	100.0%
Total Sample Air Dried Wt. + tare wt. (grams):	254.44	Tare #	59	#4	0.0	100.0%
Weight of Total Sample Air Dried:	254.44	Tare Wt.	15.80	#10	0.02	100.0%
Weight of Air Dried Hydrometer Sample (g):	50.01	Wet Wt. + A	26.41	#20	0.03	99.9%
Total Sample Oven Dried:	253.48	Dry Wt. + A	26.37	#40	0.09	99.8%
Hydrometer Sample Oven Dried (W):	49.82	Water Wt. (B-C)	0.04	#60	0.21	99.6%
% Passing #10:	100.0%	Dry Wt. (C-A)	10.57	#100	0.67	98.6%
Correction Factor a (Table 1):	1.09	% Moisture (100 x D/E)	0.38%	#200	3.04	93.9%

Description of Sand & Gravel Particles ☒ Rounded ☐ Angular ☒ Hard & Durable ☒ Soft ☐ Weathered & Friable ☐Stirring Apparatus: A ☒ B ☐ Dispersion Time: 1 min. Sodium Hexametaphosphate: 40 g./ Liter

Balance: ID No. 3222 Cal. Date: 6/25/2012 Hydrometer: ID No. 3901 Cal. Date:

Control Cylinder ☒ Composite Correction ☐ Type: 151H ☐ 152H ☒

Control Cylinder		Temp.	Composite Correction		Corrections		Hydrometer		Percent Passing		Effective Depth	Table 3		Diameter
Time			Hydrometer		Control Cylinder	Composite Correction		R	P(#10) = (R x a / W) x 100	P (total) = P x % Passing #10	L		K	D = K x (L/T) ^{1/2}
T (Min.)		(0.5 °C)	Reading											
1		21.0	45.0		5.5			39.50	86.4%	86.4%	9.8	0.01581		0.04953
2		21.0	42.0		5.5			36.50	79.9%	79.8%	10.3	0.01581		0.03589
5		21.0	37.5		5.5			32.00	70.0%	70.0%	11.0	0.01581		0.02350
15		21.0	29.0		5.5			23.50	51.4%	51.4%	12.4	0.01581		0.01440
30		21.0	22.0		5.5			16.50	36.1%	36.1%	13.6	0.01581		0.01064
60		21.0	17.0		5.5			11.50	25.2%	25.2%	14.4	0.01581		0.00775
250		21.5	11.0		5.5			5.50	12.0%	12.0%	15.4	0.01571		0.00390
1440		21.0	7.0		5.5			1.50	3.3%	3.3%	16.0	0.01581		0.00167

References / Comments / Deviations ASTM D 422, D 2487, D 4318

Oven Temperature Set at 60C.

Karen Warner
Technician NameNICET 117900
Certification #Kyle Baucom
Technical ResponsibilityProject Engineer
Position4/12/13
Date

Particle Size Analysis of Soils

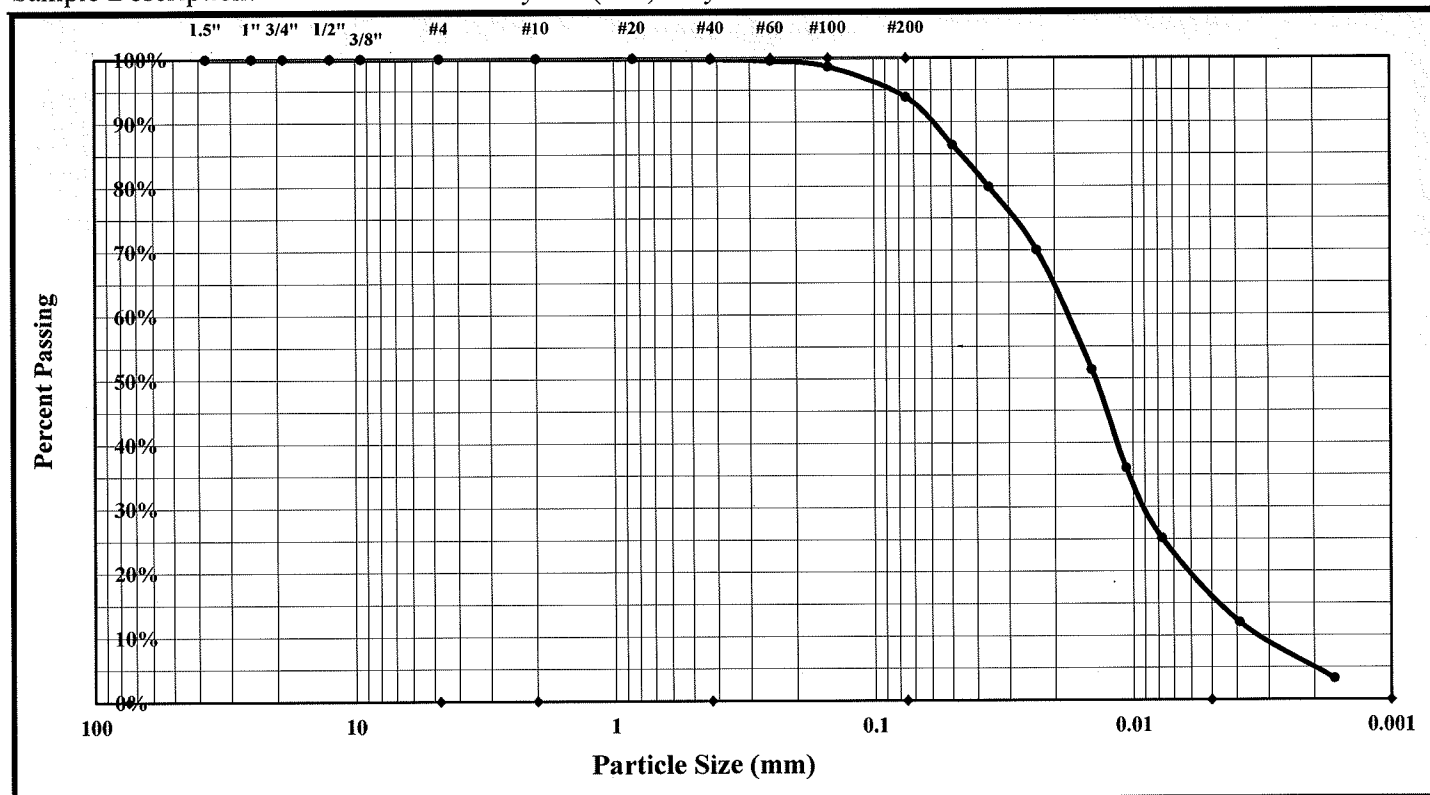


ASTM D422

Quality Assurance

S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273

S&ME Project #:	1356-11-032 Phase 03	Report Date:	4/2/13
Project Name:	Marshall Industrial Landfill No.1 - Cells 3 & 4	Test Date(s):	3/19-4/2/13
Client Name:	Duke Energy		
Address:	526 South Church Street, Charlotte, NC 28202		
Boring #:	NA	Sample #:	SG-16
		Sample Date:	3/15/13
Location:	Cell 3&4 Structural	Offset:	NA
		Elevation:	NA
Sample Description:	Black Gray Silt (ML) Fly Ash		



Cobbles	< 300 mm (12") and > 75 mm (3")	Fine Sand	< 0.425 mm and > 0.075 mm (#200)
Gravel	< 75 mm and > 4.75 mm (#4)	Silt	< 0.075 mm and > 0.005 mm
Coarse Sand	< 4.75 mm and > 2.00 mm (#10)	Clay	< 0.005 mm
Medium Sand	< 2.00 mm and > 0.425 mm (#40)	Colloids	< 0.001 mm

Maximum Particle Size:	#10	Gravel:	0.0%	Silt	82.9%
Silt & Clay (% Passing #200):	93.9%	Total Sand:	6.1%	Clay	11.0%
Moisture Content	18.5%	Colloids			
Liquid Limit	NP	Plastic Limit	NP	Plastic Index	NP
Coarse Sand:	0.0%	Medium Sand:	0.2%	Fine Sand:	5.9%

Description of Sand and Gravel	Rounded <input type="checkbox"/>	Angular <input checked="" type="checkbox"/>	Hard & Durable <input checked="" type="checkbox"/>	Soft <input type="checkbox"/>	Weathered & Friable <input type="checkbox"/>
Mechanical Stirring Apparatus A	Dispersion Period:	1 min.	Dispersing Agent:	Sodium Hexametaphosphate:	40 g./ Liter

References / Comments / Deviations: ASTM D 4318, D 854, D 2487

Technician Name: _____ Date: _____

Kyle Baucom
Technical Responsibility

[Signature]
Signature

Project Engineer
Position

4/12/13
Date

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Liquid Limit, Plastic Limit, and Plastic Index



S&ME, Inc. ~9751 Southern Pine Boulevard, Charlotte, NC 28273

Project #: 1356-11-032 Phase 03

Report Date: 4/1/13

Project Name: Marshall Industrial Landfill No.1 - Cells 3 & 4

Test Date(s) 3/19-4/1/13

Client Name: Duke Energy

Client Address: 526 South Church Street, Charlotte, NC 28202

Boring #: NA

Sample #: SG-16

Sample Date: 3/15/13

Location: Cell 3&4 Structural Fill

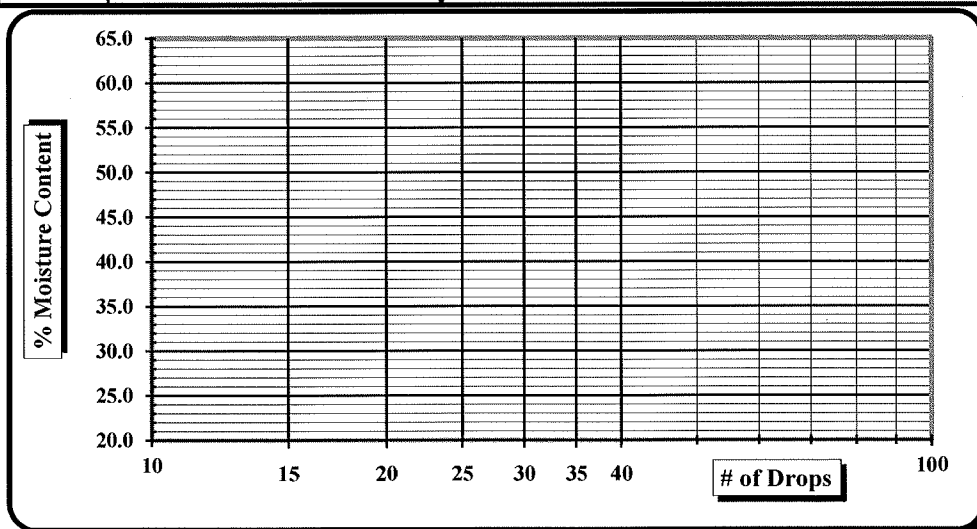
Offset: NA

Elevation: NA

Sample Description: Black Gray Silt (ML) Fly Ash

Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #	Cal Date:
Balance (0.01 g)	3222	6/25/2012	Grooving tool	27704	2/4/2013
LL Apparatus	3653	2/26/2013	Grooving tool		
Oven	10844	2/4/2013	Grooving tool		

Pan #	Tare #:	Liquid Limit						Plastic Limit		
A	Tare Weight									
B	Wet Soil Weight + A									
C	Dry Soil Weight + A									
D	Water Weight (B-C)									
E	Dry Soil Weight (C-A)									
F	% Moisture (D/E)*100									
N	# OF DROPS							Moisture Contents determined by ASTM D 2216		
LL	LL = F * FACTOR									
Ave.	Average									

NP, Non-Plastic ☒

Liquid Limit

Plastic Limit

Plastic Index

Group Symbol ML

Multipoint Method ☐One-point Method ☐Wet Preparation ☐Dry Preparation ☒Air Dried ☒

Estimate the % Retained on the #40 Sieve:

Notes / Deviations / References:

Oven Temperature Set at 60C.

ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils

Karen Warner

Technician Name

4/1/13
Date

Kyle Baucom

Technical Responsibility

4/1/13
Date

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Moisture - Density Relationship



ASTM D558, D698, D1557, AASHTO T99, T180

Quality Assurance

S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273

Project #:	1356-11-032	Phase 03	Report Date:	4/2/13
Project Name:	Marshall Industrial Landfill No. 1 - Cells 3 & 4		Test Date(s)	3/21-25/13
Client Name:	Duke Energy			
Client Address:	526 South Church Street, Charlotte, NC 28202			
Boring #:	NI	Sample #:	SG-16	Sample Date:
Location:	Cell 3&4 Structural Fill	Offset:	NI	Depth:
Sample Description:	Black Gray Silt (ML) Fly Ash			
Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #
Balance (0.1 g)	22182	6/8/2012	Compaction Mold	20116
Balance	22182	6/8/2012	Compaction Hammer	20222
Straightedge	27711	2/11/2013	Oven	22151
Sieve #4	10939	3/5/2013		

Water Content		Water Content requires GP 2 Balance (0.1 gram Readability).				Check:	
ASTM D2216 <input checked="" type="checkbox"/>		AASHTO T265 <input type="checkbox"/>		ASTM D4959 <input type="checkbox"/>		ASTM D4643 <input type="checkbox"/>	
Water Added:		200	150	100	50	As Is	
Tare #:		SQ-1	BE	6910	5K	PFM	
A. Tare Weight	A.	158.5	163.6	155.4	154.4	168.1	
B. Wet Wt + Tare Wt	B.	1105.7	1200.3	1101.9	1089.3	1087.4	
C. Dry Wt. + Tare Wt.	C.	914.6	1008.4	941.9	949.8	970.0	
D. Water Weight	B-C	191.1	191.9	160.0	139.5	117.4	
E. Dry Weight	C-A	756.1	844.8	786.5	795.4	801.9	
F. Moisture Content	100*D/E	25.3%	22.7%	20.3%	17.5%	14.6%	
Compaction Data		Requires a GP 5 Balance for ASTM (1 gram or .0022 Lb. readability).				Check:	
ASTM D558 <input type="checkbox"/>		ASTM D 698 <input checked="" type="checkbox"/>		ASTM D1557 <input type="checkbox"/>		AASHTO T99 <input type="checkbox"/>	
Method A <input checked="" type="checkbox"/>		Method B <input type="checkbox"/>		Method C <input type="checkbox"/>		Method D (ASTM 1978) <input type="checkbox"/>	
						AASHTO T180 <input type="checkbox"/>	
						AASHTO Method D <input type="checkbox"/>	
G. Wt of Soil + Mold	G.	5892	5926	5917	5849	5786	
H. Wt. of Mold	H.	4282	4282	4282	4282	4282	
I. Wt. of Soil (g. or lbs.)	G-H	1610	1644	1635	1567	1504	
J. Wt of Soil (Lbs.)	1/453.6 or 1	3.549	3.624	3.604	3.455	3.316	
K. Mold Volume Factor	K.	30.02	30.02	30.02	30.02	30.02	
L. Wet Density (PCF)	J*K	106.5	108.8	108.2	103.7	99.5	
M. Dry Density (PCF)	L/(1+F)	85.0	88.7	89.9	88.3	86.8	
Sieve Size used to separate the Oversize Fraction:		#4 Sieve <input checked="" type="checkbox"/>		3/8 inch Sieve <input type="checkbox"/>		3/4 inch Sieve <input type="checkbox"/>	
Mechanical Rammer <input checked="" type="checkbox"/>		Manual Rammer <input type="checkbox"/>		Moist Preparation <input type="checkbox"/>		Dry Preparation <input checked="" type="checkbox"/>	

References / Comments / Deviations:

*ND = Not determined *NI = Information was not provided

Jennifer Olsen
Technician Name

Signature

Certification Type/No.
3/25/2013
DateKyle Baucom
Technical Responsibility

Signature
Project Engineer
Position4/12/13
Date

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Moisture - Density Report



Quality Assurance

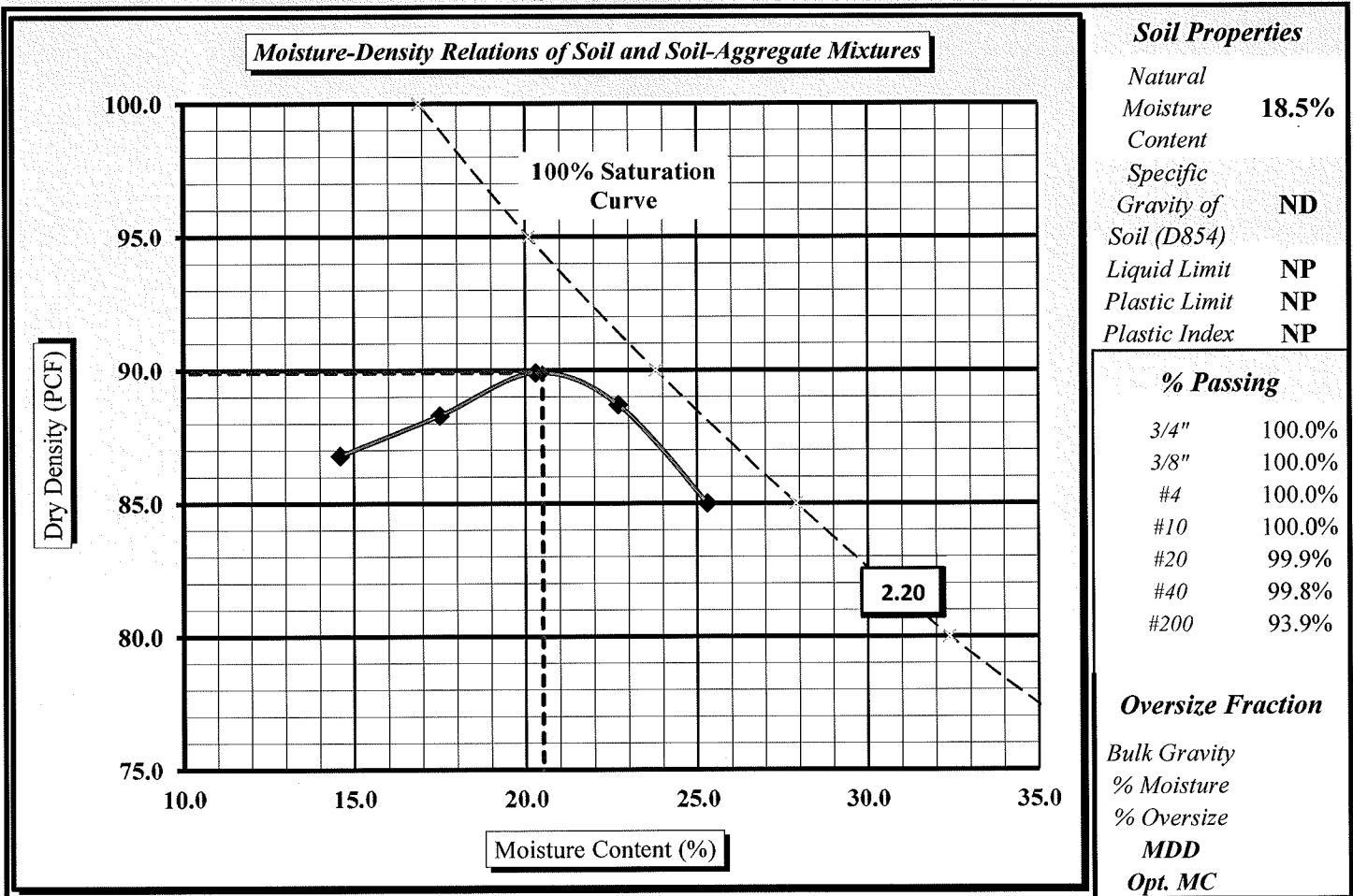
S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273

S&ME Project #:	1356-11-032	Phase 03	Report Date:	4/2/13	
Project Name:	Marshall Industrial Landfill No. 1 - Cells 3 & 4		Test Date(s):	3/21-25/13	
Client Name:	Duke Energy				
Client Address:	526 South Church Street, Charlotte, NC 28202				
Boring #:	NI	Sample #:	SG-16	Sample Date:	3/15/2013
Location:	Cell 3&4 Structural Fill	Offset:	NI	Depth:	NI
Sample Description:	Black Gray Silt (ML)	Fly Ash			

Maximum Dry Density 89.9 PCF.

Optimum Moisture Content 20.5%

ASTM D 698 -- Method A



Moisture-Density Curve Displayed: Fine Fraction ☒ Corrected for Oversize Fraction (ASTM D 4718) ☐
 Sieve Size used to separate the Oversize Fraction: #4 Sieve ☒ 3/8 inch Sieve ☐ 3/4 inch Sieve ☐
 Mechanical Rammer ☒ Manual Rammer ☐ Moist Preparation ☐ Dry Preparation ☒

References / Comments / Deviations: ND = Not determined NI = Information was not provided
 Technician: Jennifer Olsen *Jennifer Olsen* 4/3/13 Date: 3/25/13
 ASTM D 2216: Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
 ASTM D 698: Laboratory Compaction Characteristics of Soil Using Standard Effort

Kyle Baucom
Technical Responsibility

[Signature]
Signature

Project Engineer
Position

4/12/13
Date

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Laboratory Determination of Water Content

ASTM D 2216



AASHTO T 265



Quality Assurance

S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273

Project #: 1356-11-032 Phase 03

Report Date: 4/19/13

Project Name: Marshall Industrial Landfill No.1 -Cells 3&4

Test Date(s): 4/17-19/13

Client Name: Duke Energy

Client Address: 526 South Church Street, Charlotte, NC 28202

Sample by: Kyle Baucom

Sample Date(s): 4/16/13

Sampling Method:	NA
------------------	----

Drill Rig : NA

Method: A (1%)



B (0.1%)



Balance ID. 3222

Calibration Date: 6/25/12

[illegible]

Notes / Deviations / References

Oven Temperature Set at 60C.

No baggie or jar sample provided.

ASTM D 2216: Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass

Karen Warner
Technician Name

Ken W. Muse
Signature

NICET 117900
Certification Type / No.

4/24/13
Date

Kyle Baucom
Technical Responsibility


Signature

Project Engineer
Position

4/16/13
Date

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Particle Size Analysis of Soils



ASTM D 422

S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273

Project #: 1356-11-032 Phase 03

Report Date: 4/24/13

Project Name: Marshall Industrial Landfill No. 1 Cells 3&4 Test Date(s): 4/17-24/13

Client Name: Duke Energy Address: 526 South Church Street, Charlotte, NC 28202 4/16/13

Boring #: NA Sample #: SG-17 Sample Date: NA

Location: *See Below Offset: NA Elevation: NA

Sample Description: Black Gray Silt (ML)

Pan #: Beaker #: Apparent Relative Density (Assumed) 2.200

Hydrometer Jar #: Moisture Content

Pan Tare Weight (grams): Tare # Tare Wt. Natural T-8

Total Sample Air Dried Wt. + tare wt. (grams): A Wet Wt. + A 81.60 343.87

Weight of Total Sample Air Dried: B Dry Wt. + A 27.15 297.42

Weight of Air Dried Hydrometer Sample (g): C Water Wt. (B-C) 0.26 46.45

Total Sample Oven Dried: D Dry Wt. (C-A) 11.24 215.82

Hydrometer Sample Oven Dried (W): E % Moisture (100 x D/E) 2.31% 21.5%

% Passing #10: 1.09

Correction Factor a (Table 1):

Description of Sand & Gravel Particles Rounded ☐ Angular ☒ Hard & Durable ☒ Soft ☐ Weathered & Friable ☐

Stirring Apparatus: A ☒ B ☐ Dispersion Time: 1 min. Sodium Hexametaphosphate: 40 g./ Liter

Balance: ID No. 3222 Cal. Date: 6/25/2012 Hydrometer: ID No. 3901 Cal. Date: 3/25/2012

Control Cylinder ☒ Composite Correction ☐ Type: 151H ☐ 152H ☒

Time min	T (Min.)	(0.5 °C)	Hydrometer		Control Cylinder	Composite Correction	Hydrometer		P (#10) = (R x a / W) x 100	P x % Pa	P (#10)
			Reading				R				
	1	22.0	43.0		5.0		38.00		84.8%		84
	2	22.0	40.0		5.0		35.00		78.1%		78
	5	22.0	32.5		5.0		27.50		61.3%		61
	15	22.0	21.0		5.0		16.00		35.7%		35
	30	22.0	15.0		5.0		10.00		22.3%		22
	60	22.5	14.0		5.0		9.00		20.1%		20
	250	22.5	9.5		5.0		4.50		10.0%		10
	1440	22.5	6.5		5.0		1.50		3.3%		3

References / Comments / Deviations ASTM D 422, D 2487, D 4318 *Cell 3&4 Structural Fill, Grid B1

Oven Temperature was set at 60C.

Karen Warner
Technician Name

NICET 117900
Certification #

Kyle Baucom
Technical Responsibility

Project Engineer
Position

Date

Particle Size Analysis of Soils

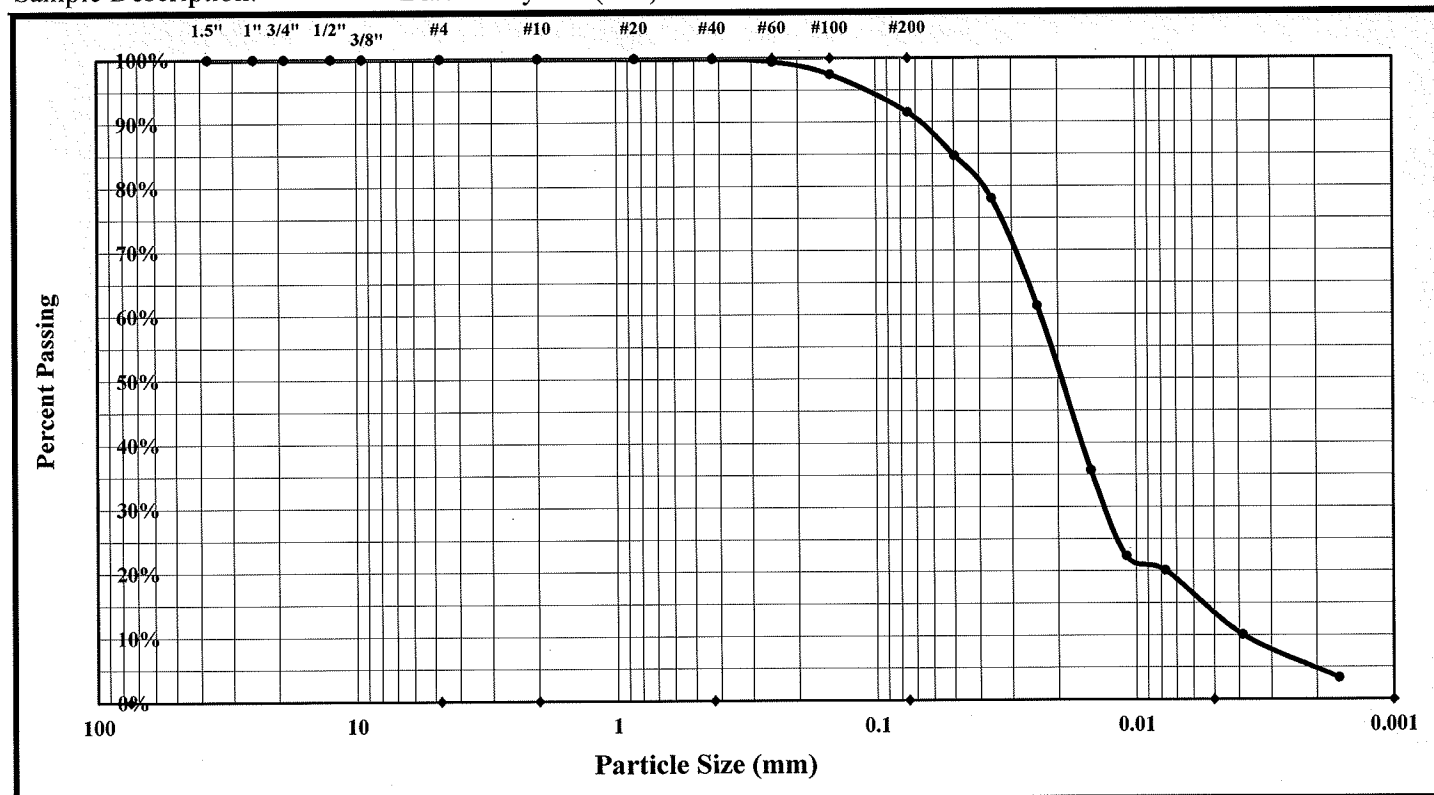


ASTM D422

Quality Assurance

S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273

S&ME Project #:	1356-11-032 Phase 03	Report Date:	4/24/13
Project Name:	Marshall Industrial Landfill No. 1 Cells 3&4	Test Date(s):	4/17-24/13
Client Name:	Duke Energy		
Address:	526 South Church Street, Charlotte, NC 28202		
Boring #:	NA	Sample #:	SG-17
		Sample Date:	4/16/13
Location:	*See Below	Offset:	NA
		Elevation:	NA
Sample Description:	Black Gray Silt (ML)		



Cobbles	< 300 mm (12") and > 75 mm (3")	Fine Sand	< 0.425 mm and > 0.075 mm (#200)
Gravel	< 75 mm and > 4.75 mm (#4)	Silt	< 0.075 and > 0.005 mm
Coarse Sand	< 4.75 mm and > 2.00 mm (#10)	Clay	< 0.005 mm
Medium Sand	< 2.00 mm and > 0.425 mm (#40)	Colloids	< 0.001 mm

Maximum Particle Size:	#20	Gravel:	0.0%	Silt	77.5%
Silt & Clay (% Passing #200):	91.5%	Total Sand:	8.5%	Clay	14.0%
Unit Relative Density (Assumed)	2.200	Moisture Content	21.5%	Colloids	
Liquid Limit	NP	Plastic Limit	NP	Plastic Index	NP
Coarse Sand:	0.0%	Medium Sand:	0.1%	Fine Sand:	8.4%
Description of Sand and Gravel	Rounded <input type="checkbox"/>	Angular <input checked="" type="checkbox"/>	Hard & Durable <input checked="" type="checkbox"/>	Soft <input type="checkbox"/>	Weathered & Friable <input type="checkbox"/>
Mechanical Stirring Apparatus A	Dispersion Period:	1 min.	Dispersing Agent:	Sodium Hexametaphosphate:	40 g./ Liter

References / Comments / Deviations: ASTM D 4318, D 854, D 2487

Technician Name: Kyle Baucom Date: 4/24/13

Kyle Baucom
Technical Responsibility

[Signature]
Signature

Project Engineer
Position

4/26/13
Date

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Liquid Limit, Plastic Limit, and Plastic Index



Another code

ASTM D 4318



AASHTO T 89



AASHTO T 90



Quality Assurance

S&ME, Inc. ~9751 Southern Pine Boulevard, Charlotte, NC 28273

Project #: 1356-11-032 Phase 03

Report Date: 4/24/13

Project Name: Marshall Industrial Landfill No.1 - Cells 3 & 4

Test Date(s) 4/17-24/13

Client Name: Duke Energy

Client Address: 526 South Church Street, Charlotte, NC 28202

Boring #: NA

Sample #: SG-17

Sample Date: 4/16/13

Location: *See Below

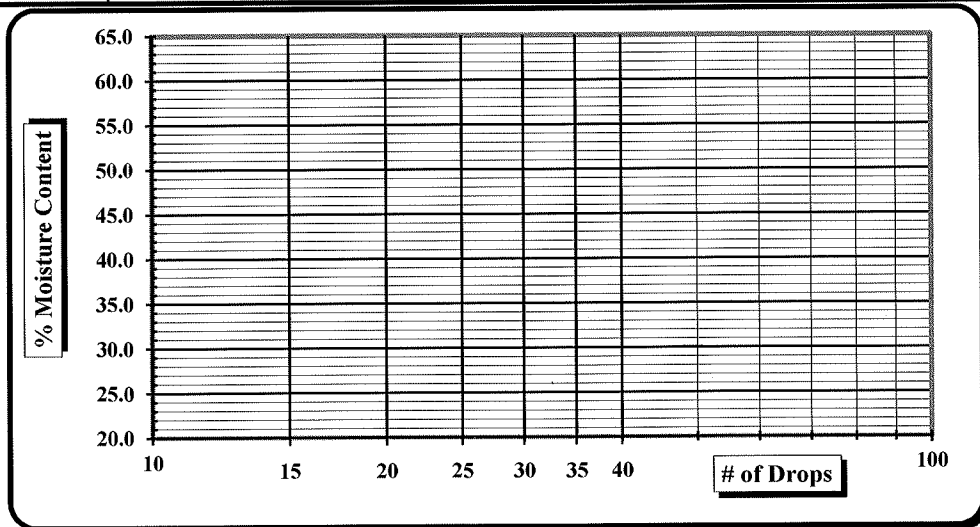
Offset: NA

Elevation: NA

Sample Description: Black Gray Silt (ML)

Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #	Cal Date:
Balance (0.01 g)	3222	6/25/2012	Grooving tool	27704	2/4/2013
LL Apparatus	3653	2/26/2013	Grooving tool		
Oven	10844	2/4/2013	Grooving tool		

Pan #	Tare #:	Liquid Limit						Plastic Limit		
A	Tare Weight									
B	Wet Soil Weight + A									
C	Dry Soil Weight + A									
D	Water Weight (B-C)									
E	Dry Soil Weight (C-A)									
F	% Moisture (D/E)*100									
N	# OF DROPS							Moisture Contents determined by ASTM D 2216		
LL	LL = F * FACTOR									
Ave.	Average									

NP, Non-Plastic ☒

Liquid Limit

Plastic Limit

Plastic Index

Group Symbol ML

Multipoint Method ☒One-point Method ☐Wet Preparation ☐Dry Preparation ☒Air Dried ☒

Estimate the % Retained on the #40 Sieve:

Notes / Deviations / References:

*Cell 3 & 4 Structural Fill, Grid B1

ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils

Karen Warner

Technician Name

4/24/13
Date

Kyle Baucom

Technical Responsibility

4/26/13
Date

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Moisture - Density Report



Quality Assurance

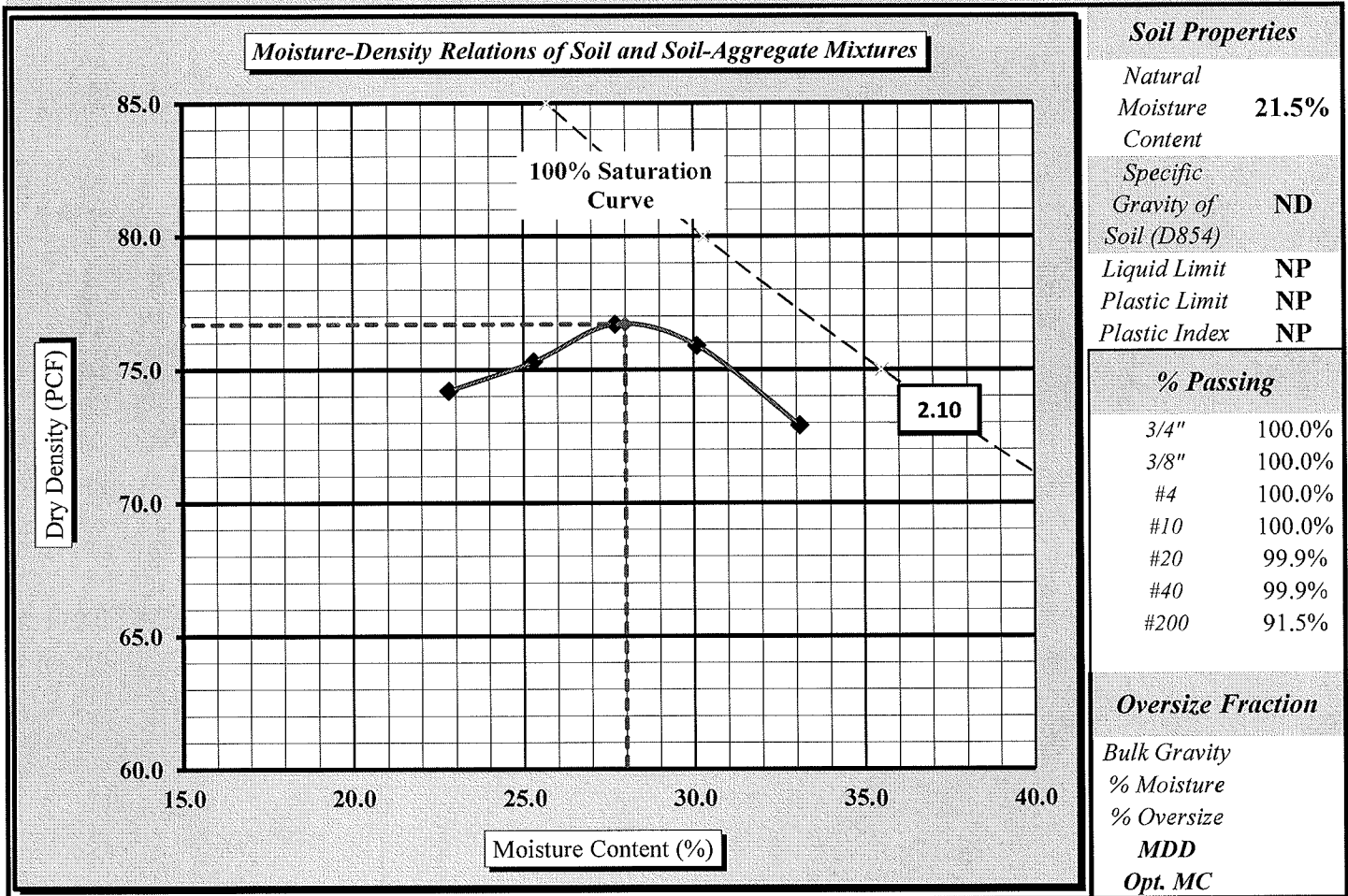
S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273

S&ME Project #:	1356-11-032	Phase 03	Report Date:	4/29/13	
Project Name:	Marshall Industrial Landfill No. 1 - Cells 3 & 4		Test Date(s):	4/26-29/13	
Client Name:	Duke Energy				
Client Address:	526 South Church Street, Charlotte, NC 28202				
Boring #:	NI	Sample #:	SG-17	Sample Date:	4/16/2013
Location:	**See Comments Below	Offset:	NI	Depth:	NI
Sample Description:	Black Gray Silt (ML) [Fly Ash]				

Maximum Dry Density 76.7 PCF.

Optimum Moisture Content 28.0%

ASTM D 698 -- Method A



Moisture-Density Curve Displayed: Fine Fraction ☒ Corrected for Oversize Fraction (ASTM D 4718) ☐
 Sieve Size used to separate the Oversize Fraction: #4 Sieve ☒ 3/8 inch Sieve ☐ 3/4 inch Sieve ☐
 Mechanical Rammer ☒ Manual Rammer ☐ Moist Preparation ☐ Dry Preparation ☒

References / Comments / Deviations: ND = Not determined NI = Information was not provided

Technician: Jennifer Olsen *Jennifer Olsen* Date: 4/29/13 **Sample Location: Cell 3 & 4 Structural Fill, Grid B1

ASTM D 2216: Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass

ASTM D 698: Laboratory Compaction Characteristics of Soil Using Standard Effort

Kyle Baucom
Technical Responsibility

[Signature]
Signature

Project Engineer
Position

4/29/13
Date

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Moisture - Density Relationship



ASTM D558, D698, D1557, AASHTO T99, T180

Quality Assurance

S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273

Project #:	1356-11-032	Phase 03	Report Date:	4/29/13	
Project Name:	Marshall Industrial Landfill No. 1 - Cells 3 & 4			Test Date(s)	4/26-29/13
Client Name:	Duke Energy				
Client Address:	526 South Church Street, Charlotte, NC 28202				
Boring #:	NI	Sample #:	SG-17	Sample Date:	4/16/2013
Location:	**See Comments Below	Offset:	NI	Depth:	NI
Sample Description:	Black Gray Silt (ML) [Fly Ash]				

Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #	Cal Date:
Balance (0.1 g)	22182	6/8/2012	Compaction Mold	20116	2/4/2013
Balance	22182	6/8/2012	Compaction Hammer	20222	6/6/2012
Straightedge	27711	2/11/2013	Oven	22151	4/4/2013
Sieve #4	10939	3/5/2013			

Water Content		Water Content requires GP 2 Balance (0.1 gram Readability).				Check:	
ASTM D2216 <input checked="" type="checkbox"/>		AASHTO T265 <input type="checkbox"/>		ASTM D4959 <input type="checkbox"/>		ASTM D4643 <input type="checkbox"/>	
Water Added:	600	550	500	450	=400 (328)		
Tare #:	5L	5C	6911	HK	JC		
A. Tare Weight	A.	156.5	156.4	155.4	160.4	164.8	
B. Wet Wt + Tare Wt	B.	1220.9	1124.4	976.6	1166.2	985.6	
C. Dry Wt. + Tare Wt.	C.	956.4	900.7	798.5	963.2	833.1	
D. Water Weight	B-C	264.5	223.7	178.1	203.0	152.5	
E. Dry Weight	C-A	799.9	744.3	643.1	802.8	668.3	
F. Moisture Content	100*D/E	33.1%	30.1%	27.7%	25.3%	22.8%	
Compaction Data		Requires a GP 5 Balance for ASTM (1 gram or .0022 Lb. readability).				Check:	
ASTM D558 <input type="checkbox"/>		ASTM D 698 <input checked="" type="checkbox"/>		ASTM D1557 <input type="checkbox"/>		AASHTO T99 <input type="checkbox"/>	
Method A <input checked="" type="checkbox"/>		Method B <input type="checkbox"/>		Method C <input type="checkbox"/>		Method D (ASTM 1978) <input type="checkbox"/>	
						AASHTO T180 <input type="checkbox"/>	
						AASHTO Method D <input type="checkbox"/>	
G. Wt of Soil + Mold	G.	5746	5772	5759	5705	5657	
H. Wt. of Mold	H.	4280	4280	4280	4280	4280	
I. Wt. of Soil (g. or lbs.)	G-H	1466	1492	1479	1425	1377	
J. Wt of Soil (Lbs.)	I/453.6 or I	3.232	3.289	3.261	3.142	3.036	
K. Mold Volume Factor	K.	30.02	30.02	30.02	30.02	30.02	
L. Wet Density (PCF)	J*K	97.0	98.7	97.9	94.3	91.1	
M. Dry Density (PCF)	L/(1+F)	72.9	75.9	76.7	75.3	74.2	
Sieve Size used to separate the Oversize Fraction:		#4 Sieve <input checked="" type="checkbox"/>		3/8 inch Sieve <input type="checkbox"/>		3/4 inch Sieve <input type="checkbox"/>	
Mechanical Rammer <input checked="" type="checkbox"/>		Manual Rammer <input type="checkbox"/>		Moist Preparation <input type="checkbox"/>		Dry Preparation <input checked="" type="checkbox"/>	

References / Comments / Deviations: *ND = Not determined *NI = Information was not provided

**Sample Location: Cell 3 & 4 Structural Fill, Grid B1

Jennifer Olsen
Technician Name

Signature

Certification Type/No.
4/29/2013
DateKyle Baucom
Technical Responsibility

Signature
Project Engineer
Position4/29/13
Date

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Liquid Limit, Plastic Limit, and Plastic Index



Another code

ASTM D 4318



AASHTO T 89



AASHTO T 90



Quality Assurance

S&ME, Inc. ~9751 Southern Pine Boulevard, Charlotte, NC 28273

Project #: 1356-11-032 Phase 03 Report Date: 5/24/13

Project Name: Marshall Industrial Landfill No. 1 - Cells c & 4 Test Date(s) 5/15-21/13

Client Name: Duke Energy

Client Address: 526 South Church Street, Charlotte, NC 28202

Boring #: NI Sample #: SG-18 Sample Date: 5/13/13

Location: **See Below Offset: NI Elevation: NI

Sample Description: Gray Silt (ML) [Fly Ash]

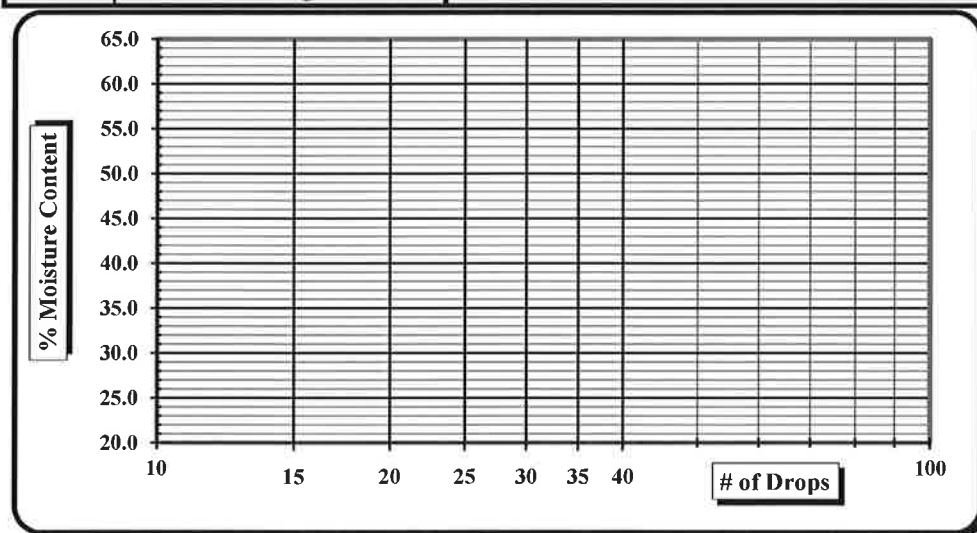
Type and Specification S&ME ID # Cal Date: Type and Specification S&ME ID # Cal Date:

Balance (0.01 g) Grooving tool

LL Apparatus Grooving tool

Oven Grooving tool

Pan #		Liquid Limit						Plastic Limit		
Tare #:										
A	Tare Weight									
B	Wet Soil Weight + A									
C	Dry Soil Weight + A									
D	Water Weight (B-C)									
E	Dry Soil Weight (C-A)									
F	% Moisture (D/E)*100									
N	# OF DROPS							Moisture Contents determined by ASTM D 2216		
LL	LL = F * FACTOR									
Ave.	Average									



One Point Liquid Limit			
N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic ☒

Liquid Limit

Plastic Limit

Plastic Index

Group Symbol ML

Multipoint Method ☒One-point Method ☐Wet Preparation ☐ Dry Preparation ☒ Air Dried ☒

Estimate the % Retained on the #40 Sieve:

Notes / Deviations / References: NI = No information provided.

**Sample Location: Cell 3 & 4 Structural Fill, Grid C2

ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils

Jennifer Olsen
Technician Name

5/24/2013
DateKyle Baucom
Technical Responsibility

Date

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Particle Size Analysis of Soils

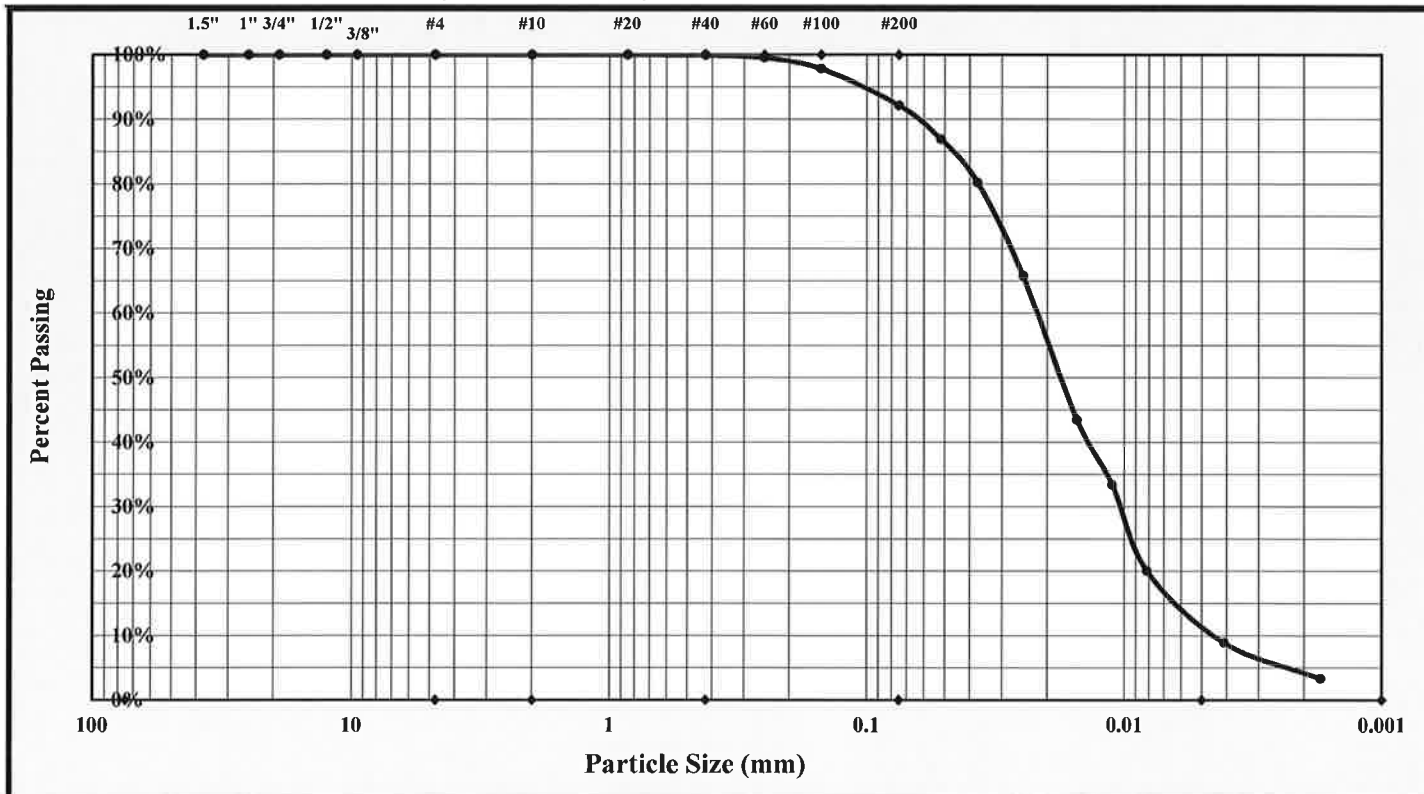


ASTM D422

Quality Assurance

S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273

S&ME Project #:	1356-12-021 Phase 01	Report Date:	5/24/13
Project Name:	Marshall Ind. LF No.1 - Cells 3 & 4	Test Date(s):	5/15-24/13
Client Name:	Duke Energy		
Address:	526 S. Church St., Charlotte, NC 28202		
Boring #:	NI	Sample #:	SG-18
Location:	**See Below	Offset:	NI
		Elevation:	NI
Sample Description:	Gray Silt (ML) [Fly Ash]		



Cobbles	< 300 mm (12") and > 75 mm (3")	Fine Sand	< 0.425 mm and > 0.075 mm (#200)
Gravel	< 75 mm and > 4.75 mm (#4)	Silt	< 0.075 and > 0.005 mm
Coarse Sand	< 4.75 mm and > 2.00 mm (#10)	Clay	< 0.005 mm
Medium Sand	< 2.00 mm and > 0.425 mm (#40)	Colloids	< 0.001 mm

Maximum Particle Size:	#40	Gravel:	0.0%	Silt	80.7%
Silt & Clay (% Passing #200):	92.2%	Total Sand:	7.8%	Clay	11.5%
ant Relative Density (Assumed)	2.100	Moisture Content	24.9%	Colloids	ND
Liquid Limit	NP	Plastic Limit	NP	Plastic Index	NP
Coarse Sand:	0.0%	Medium Sand:	0.1%	Fine Sand:	7.8%

Description of Sand and Gravel Rounded ☐ Angular ☒ Hard & Durable ☒ Soft ☐ Weathered & Friable ☐

Mechanical Stirring Apparatus A Dispersion Period: 1 min. Dispersing Agent: Sodium Hexametaphosphate: 40 g./ Liter

References / Comments / Deviations: ASTM D 4318, D 854, D 2487 **Sample Location: Cell 3&4 Structural Fill NI = No information provided.

Technician Name: Jennifer Olsen Date: 5/24/13

Kyle Bancom
Technical Responsibility

[Signature]
Signature

Staff Professional
Position

5/28/13
Date

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Particle Size Analysis of Soils



ASTM D 422

S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273

Project #: 1356-12-021 Phase 01

Report Date: 5/24/13

Project Name: Marshall Ind. LF No.1 - Cells 3 & 4

Test Date(s): 5/15-24/13

Client Name:		Duke Energy		Address: 526 S. Church St., Charlotte, NC 28202		Sieve	Retained Wt.	Percent Passing	
Boring #:	NI	Sample #:	SG-18	Sample Date:	5/13/13	3.0"	0.0	Pan # (washed)	100.0%
Location:	**See Below	Offset:	NI	Elevation:	NI	1.5"	0.0		100.0%
Sample Description: Gray Silt (ML) [Fly Ash]						1.0"	0.0		100.0%
Pan #:	TQ	Beaker #:	SW	Apparent Relative Density (Assumed)		2.100	0.0	100.0%	
Hydrometer Jar #:		6				1/2"	0.0	100.0%	
Pan Tare Weight (grams):		0.00		Moisture Content		Natural	0.0	Soil Mortar	100.0%
Total Sample Air Dried Wt. + tare wt. (grams):		371.90		Tare #		79	0.0		100.0%
Weight of Total Sample Air Dried:		371.90		A		Tare Wt.	16.04		100.0%
Weight of Air Dried Hydrometer Sample (g):		50.00		B		Wet Wt. + A	26.70	100.0%	100.0%
Total Sample Oven Dried:		370.50		C		Dry Wt. + A	26.66	99.9%	99.9%
Hydrometer Sample Oven Dried (W):		49.81		D		Water Wt. (B-C)	0.04	99.5%	99.5%
% Passing #10:		100.0%		E		Dry Wt. (C-A)	10.62	97.8%	97.8%
Correction Factor a (Table 1):		1.11		% Moisture (100 x D/E)		0.38%	3.91	92.2%	92.2%

Description of Sand & Gravel Particles: ☒ Rounded ☐ Angular ☒ Hard & Durable ☒ Soft ☐ Weathered & Friable ☐Stirring Apparatus: A ☒ B ☐ Dispersion Time: 1 min. Sodium Hexametaphosphate: 40 g./ Liter

Balance: ID No. 3222 Cal. Date: 6/25/2012 Hydrometer: ID No. 3901 Cal. Date: 3/25/2012

Control Cylinder		<input checked="" type="checkbox"/> Composite Correction		Type: 151H <input type="checkbox"/> 152H <input checked="" type="checkbox"/>		Percent Passing		Effective		Diameter	
Time	Temp.	Hydrometer	Corrections	Hydrometer	P(#10) =	P (total) =	Depth	Table 3	D =		
T (Min.)	(0.5 °C)	Reading	Control	Composite	(R x a / W) x 100	P x % Passing #10	L	K	K x (L/T) ^{1/2}		
1	21.5	43.0	4.0	4.0	86.9%	86.9%	9.9	0.01641	0.05164		
2	21.5	40.0	4.0	4.0	80.2%	80.2%	10.4	0.01641	0.03741		
5	21.5	33.5	4.0	4.0	65.7%	65.7%	11.5	0.01641	0.02484		
15	21.5	23.5	4.0	4.0	43.5%	43.5%	13.1	0.01641	0.01534		
30	21.5	19.0	4.0	4.0	33.4%	33.4%	13.8	0.01641	0.01114		
60	21.5	13.0	4.0	4.0	20.1%	20.1%	14.8	0.01641	0.00816		
250	21.5	8.0	4.0	4.0	8.9%	8.9%	15.6	0.01641	0.00410		
1440	21.5	5.5	4.0	4.0	3.3%	3.3%	16.0	0.01641	0.00173		

References / Comments / Deviations ASTM D 422, D 2487, D 4318

**Sample Location: Cell 3 & 4 Structural Fill, Grid C2

NI = No information provided. ND = Not determined.

Jennifer Olsen

Technician Name

Kyle Baucom

Technical Responsibility

Staff Professional

Position

Signature: *J. Olsen* 5/24/13

Date

Signature: *S. S&ME*

Date

Moisture - Density Report



Quality Assurance

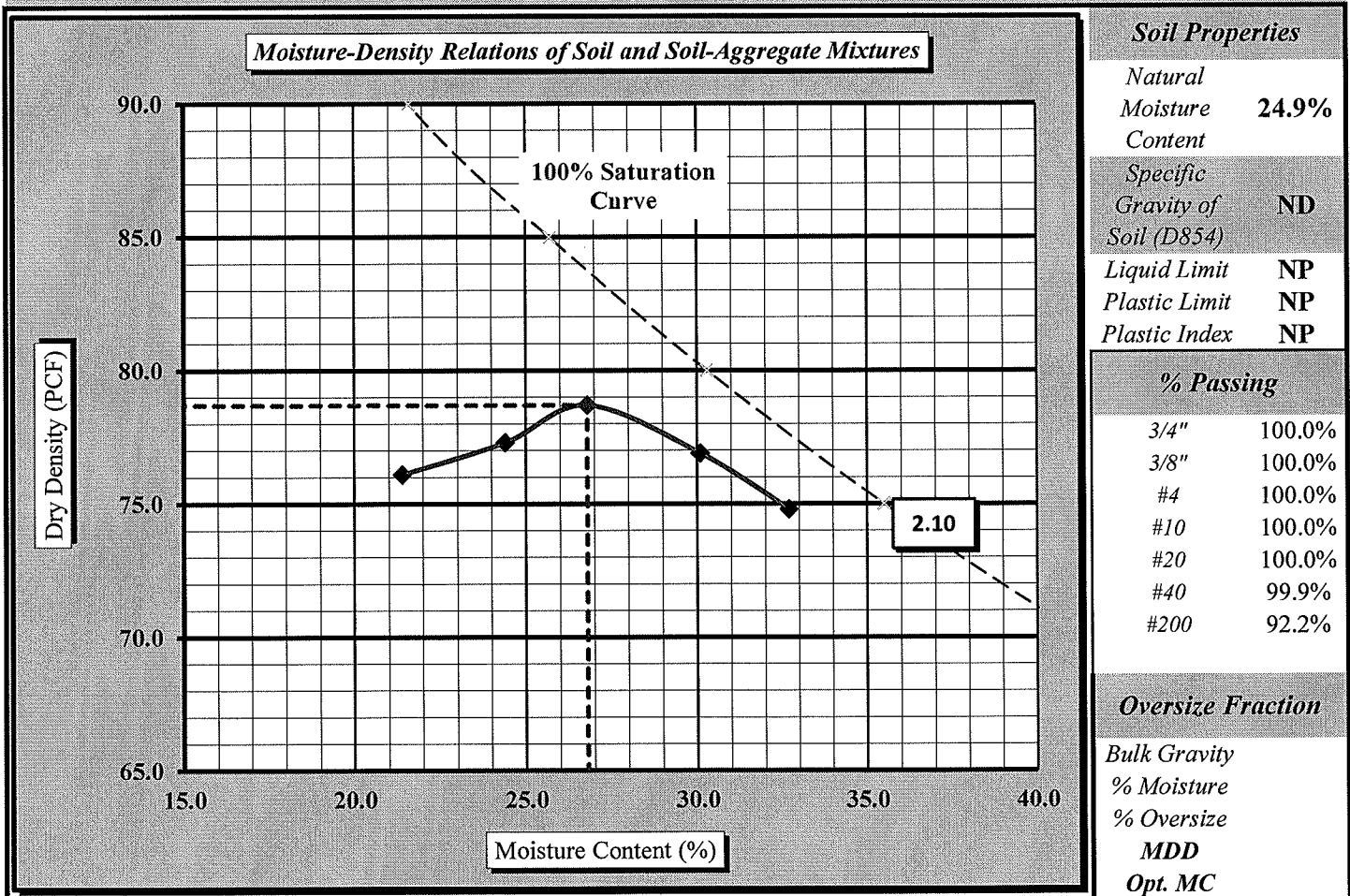
S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273

S&ME Project #:	1356-11-032	Phae 03	Report Date:	5/31/13	
Project Name:	Marshall Industrial Landfill No. 1 - Cells 3 & 4		Test Date(s):	5/29-31/13	
Client Name:	Duke Energy				
Client Address:	526 South Church Street, Charlotte, NC 28202				
Boring #:	NI	Sample #:	SG-18	Sample Date:	5/13/2013
Location:	**See Comments	Offset:	NI	Depth:	NI
Sample Description:	Gray Silt (ML) [Fly Ash]				

Maximum Dry Density 78.7 PCF.

Optimum Moisture Content 26.8%

ASTM D 698 -- Method A



Moisture-Density Curve Displayed: Fine Fraction ☒ Corrected for Oversize Fraction (ASTM D 4718) ☐
 Sieve Size used to separate the Oversize Fraction: #4 Sieve ☒ 3/8 inch Sieve ☐ 3/4 inch Sieve ☐
 Mechanical Rammer ☒ Manual Rammer ☐ Moist Preparation ☐ Dry Preparation ☒

References / Comments / Deviations: ND = Not determined NI = Information was not provided
 Technician: Jennifer Olsen *Jennifer Olsen* Date: 5/31/13 **Sample Location** Cells 3 & 4 Structural Fill, Grid C2
 ASTM D 2216: Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
 ASTM D 698: Laboratory Compaction Characteristics of Soil Using Standard Effort

Kyle Baucom
 Technical Responsibility

Kyle Baucom
 Signature

Staff Professional
 Position

6/3/13
 Date

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Moisture - Density Relationship



ASTM D558, D698, D1557, AASHTO T99, T180

Quality Assurance

S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273

Project #:	1356-11-032	Phae 03	Report Date:	5/31/13		
Project Name:	Marshall Industrial Landfill No. 1 - Cells 3 & 4			Test Date(s)	5/29-31/13	
Client Name:	Duke Energy					
Client Address:	526 South Church Street, Charlotte, NC 28202					
Boring #:	NI	Sample #:	SG-18	Sample Date:	5/13/2013	
Location:	**See Comments	Offset:	NI	Depth:	NI	
Sample Description:	Gray Silt (ML) [Fly Ash]					
Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #	Cal Date:	
Balance (0.1 g)	22182	6/8/2012	Compaction Mold	20116	2/4/2013	
Balance	22182	6/8/2012	Compaction Hammer	20222	6/6/2012	
Straightedge	27711	2/11/2013	Oven	22151	4/4/2013	
Sieve #4	10939	3/5/2013				
Water Content						
Water Content requires GP 2 Balance (0.1 gram Readability).						
Check:						
ASTM D2216 <input checked="" type="checkbox"/>	AASHTO T265 <input type="checkbox"/>	ASTM D4959 <input type="checkbox"/>			ASTM D4643 <input type="checkbox"/>	
Water Added:	150	200	250	300	350	
Tare #:	5B	13	MJD	JRC	5F	
A. Tare Weight	A.	159.9	156.8	160.4	157.7	160.2
B. Wet Wt + Tare Wt	B.	1047.4	1171.0	1121.7	1108.6	1162.6
C. Dry Wt. + Tare Wt.	C.	891.0	972.3	918.7	888.7	915.4
D. Water Weight	B-C	156.4	198.7	203.0	219.9	247.2
E. Dry Weight	C-A	731.1	815.5	758.3	731.0	755.2
F. Moisture Content	100*D/E	21.4%	24.4%	26.8%	30.1%	32.7%
Compaction Data						
Requires a GP 5 Balance for ASTM (1 gram or .0022 Lb. readability).						
Check:						
ASTM D558 <input type="checkbox"/>	ASTM D 698 <input checked="" type="checkbox"/>	ASTM D1557 <input type="checkbox"/>	AASHTO T99 <input type="checkbox"/>	AASHTO T180 <input type="checkbox"/>		
Method A <input checked="" type="checkbox"/>	Method B <input type="checkbox"/>	Method C <input type="checkbox"/>	Method D (ASTM 1978) <input type="checkbox"/>	AASHTO Method D <input type="checkbox"/>		
G. Wt of Soil + Mold	G.	5675	5733	5787	5790	5778
H. Wt. of Mold	H.	4279	4279	4279	4279	4279
I. Wt. of Soil (g. or lbs.)	G-H	1396	1454	1508	1511	1499
J. Wt of Soil (Lbs.)	I/453.6 or I	3.078	3.205	3.325	3.331	3.305
K. Mold Volume Factor	K.	30.02	30.02	30.02	30.02	30.02
L. Wet Density (PCF)	J*K	92.4	96.2	99.8	100.0	99.2
M. Dry Density (PCF)	L/(1+F)	76.1	77.3	78.7	76.9	74.8
Sieve Size used to separate the Oversize Fraction: #4 Sieve <input checked="" type="checkbox"/> 3/8 inch Sieve <input type="checkbox"/> 3/4 inch Sieve <input type="checkbox"/>						
Mechanical Rammer <input checked="" type="checkbox"/> Manual Rammer <input type="checkbox"/> Moist Preparation <input type="checkbox"/> Dry Preparation <input checked="" type="checkbox"/>						

References / Comments / Deviations: *ND = Not determined *NI = Information was not provided

Jennifer Olsen

Technician Name

Signature

Certification Type/No.

5/31/2013

Date

Kyle Baucom

Technical Responsibility

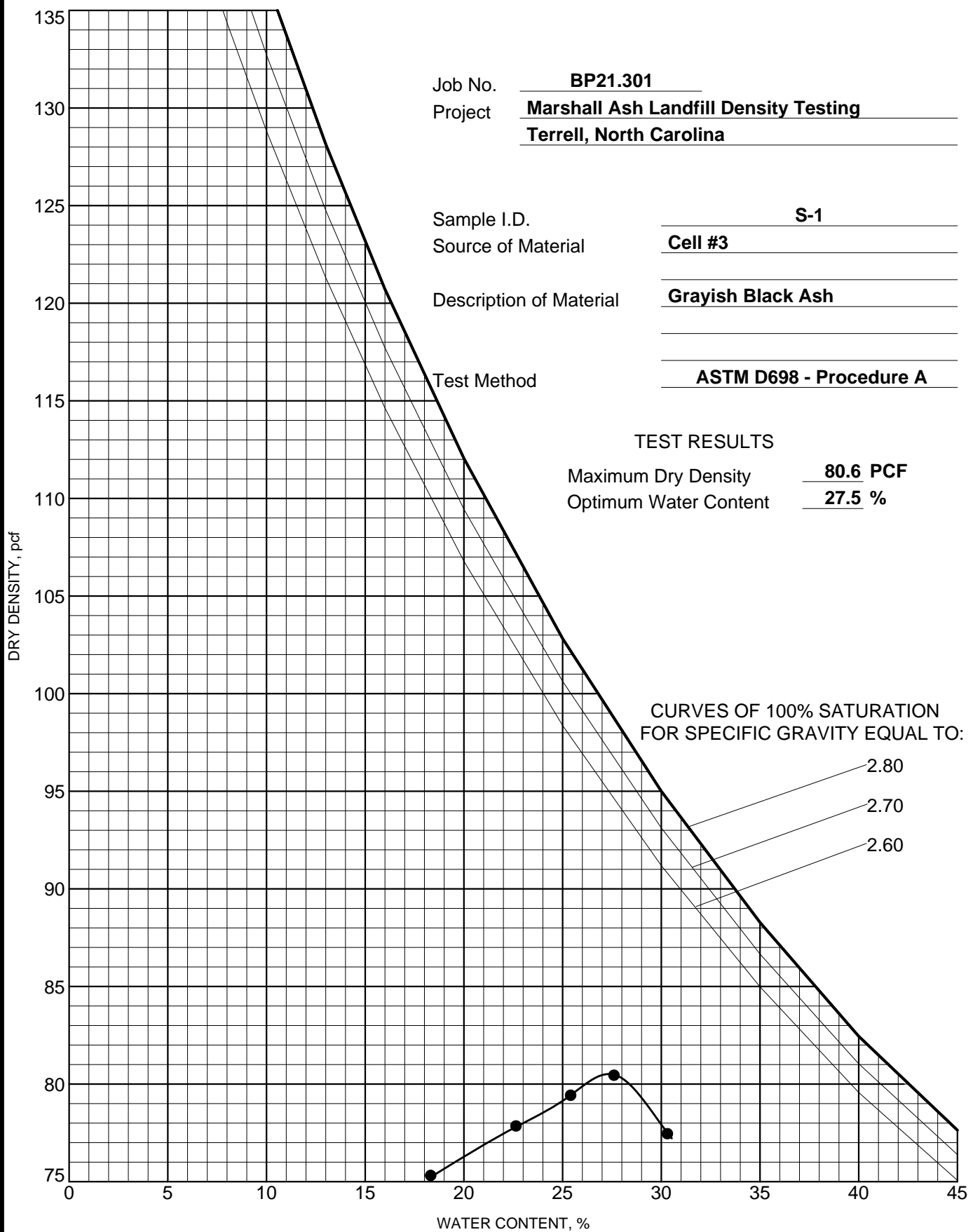
Signature

Position

Date

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ESP_COMPACTION1 (75-135 PCF) BP21.301.GPJ LOG-LAB.GDT 4/30/13



3475 Lakemont Boulevard
Fort Mill, South Carolina
Telephone: 803.802.2440
Fax: 803.802.2515

MOISTURE-DENSITY RELATIONSHIP

Project: Marshall Ash Landfill Density Testing

Location: Terrell, North Carolina

Number: BP21.301

Moisture - Density Relationship

Test Methods ASTM D 698, D 1557, D2216, AASHTO T99, T180, T265



Project No: E4-BP21.301		Project Name:						
Lab No: 3960		Marshall Ash Landfill		Date: 4/29/2013				
Sample No: S-1, Cell #3				Tech: T. Summers				
*Soil Description: Grayish Black Ash								
Type and Specification	ESP ID#	Cal. Date:	Type and Specification	ESP ID#	Cal. Date:			
Balance (0.1 g)	C-1B	1/30/2013	Compaction Mold	6A-4	1/18/2013			
Balance	E-1C	1/30/2013	Compaction Hammer	7A-2	9/7/2012			
Straightedge	8C	1/16/2013	Oven	ESP-2	2/1/2013			
Sieve #4	3G	9/30/2012						
Proctor Method Determination D698 Method A								
Proctor Workout		Date:	Tech:					
		4/27/2013	T. Summers					
Point Number	1	2	3	4	5	6	7	8
Weight Soil and Mold (g)	5562	5658	5720	5766	5740			
Weight of Proctor Mold (g)	4220	4220	4220	4220	4220			
Weight of Soil in Mold (g)	1342	1438	1500	1546	1520			
Weight of Soil in Mold (lbs)	2.959	3.170	3.307	3.408	3.351			
Volume of Mold (cu.ft.) .0001	0.0332	0.0332	0.0332	0.0332	0.0332			
Wet Unit Weight (pcf)	89.1	95.5	99.6	102.7	100.9			
Moisture Can No								
Weight of Can	85.65	79.58	79.51	87.36	81.45			
Weight of Wet Soil & Can	586.75	674.25	697.48	646.3	639.11			
Weight of Dry Soil & Can	509.18	565.98	572.29	525.4	509.41			
Weight of Water	77.57	108.27	125.19	120.9	129.7			
Weight of Dry Soil	423.53	486.4	492.78	438.04	427.96			
Moisture Content (%)	18.32%	22.26%	25.40%	27.60%	30.31%			
Dry Unit Weight (pcf)	75.3	78.1	79.4	80.5	77.5			

Comments:

Tony Summers
Technician Name

Anthony M. Summers
Signature

AMRL - N/A
Certification Type/No.

4/29/2013
Date

David A. Bixler II, PE
Technical Responsibility

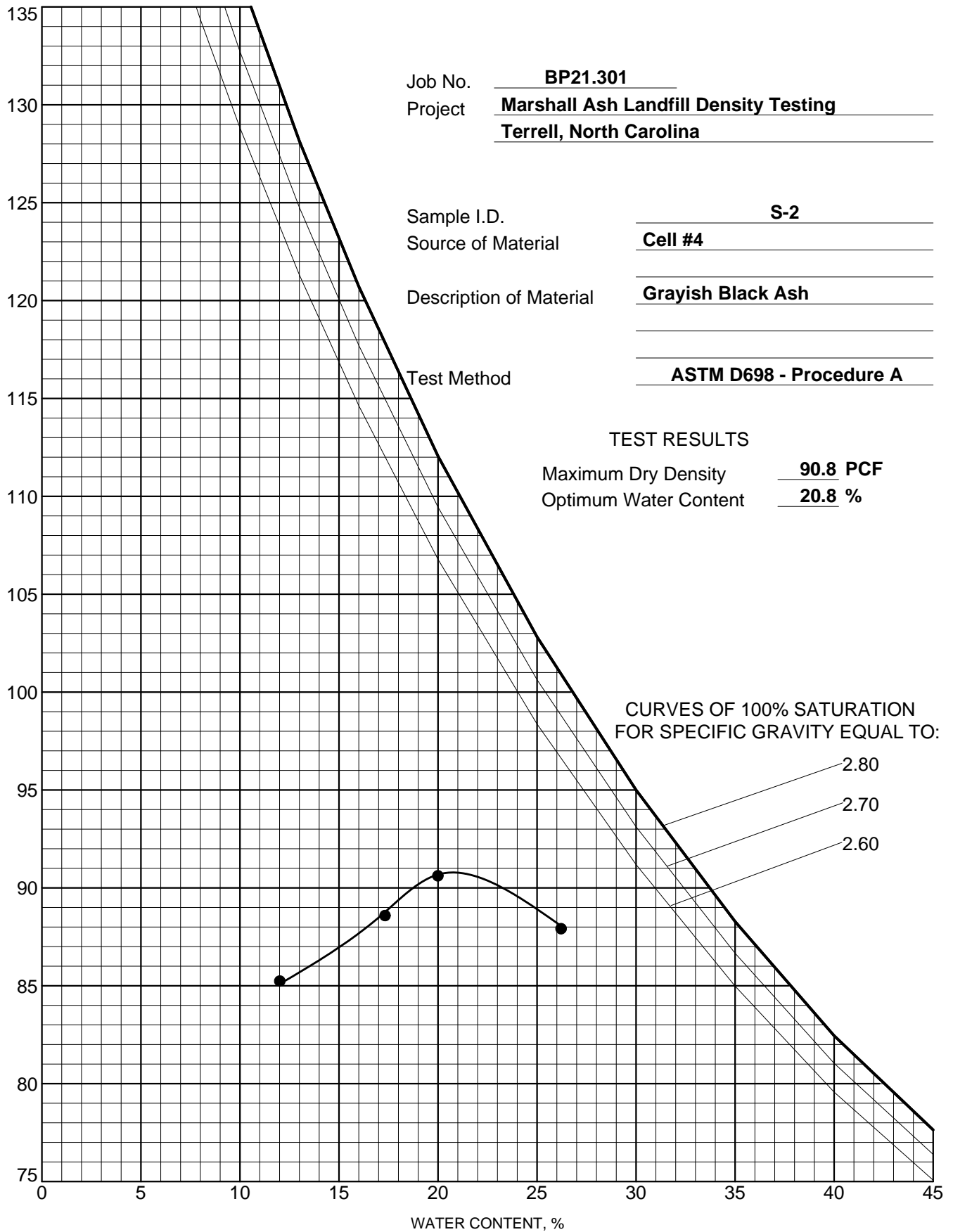
David A. Bixler II
Signature

Sr. Project Engineer
Position

4/29/2013
Date

Form ESP-L-01.04__Rev. 03__7/24/09

Moisture-Density Relationship



3475 Lakemont Boulevard
Fort Mill, South Carolina
Telephone: 803.802.2440
Fax: 803.802.2515

MOISTURE-DENSITY RELATIONSHIP

Project: Marshall Ash Landfill Density Testing

Location: Terrell, North Carolina

Number: BP21.301

Moisture - Density Relationship

Test Methods ASTM D 698, D 1557, D2216, AASHTO T99, T180, T265



Project No: E4-BP21.301		Project Name:					
Lab No: 3961		Marshall Ash Landfill		Date: 4/26/2013			
Sample No: S-2, Cell #4				Tech: T. Summers			
*Soil Description: Grayish Black Ash							
Type and Specification	ESP ID#	Cal. Date:	Type and Specification	ESP ID#	Cal. Date:		
Balance (0.1 g)	C-1B	1/30/2013	Compaction Mold	6A-4	1/18/2013		
Balance	E-1C	1/30/2013	Compaction Hammer	7A-2	9/7/2012		
Straightedge	8C	1/16/2013	Oven	ESP-2	2/1/2013		
Sieve #4	3G	9/30/2012					
Proctor Method Determination D698 Method A							
Proctor Workout		Date:	Tech:				
		4/25/2013	T. Summers				
Point Number	1	2	3	4	5	6	7
Weight Soil and Mold (g)	5649	5783	5851	5891			
Weight of Proctor Mold (g)	4220	4220	4220	4220			
Weight of Soil in Mold (g)	1429	1563	1631	1671			
Weight of Soil in Mold (lbs)	3.150	3.446	3.596	3.684			
Volume of Mold (cu.ft.) .0001	0.0332	0.0332	0.0332	0.0332			
Wet Unit Weight (pcf)	94.9	103.8	108.3	111.0			
Moisture Can No							
Weight of Can	87.69	87.85	81.69	85.8			
Weight of Wet Soil & Can	749.49	688.3	669.38	805.83			
Weight of Dry Soil & Can	683.18	596.05	573.79	656.29			
Weight of Water	66.31	92.25	95.59	149.54			
Weight of Dry Soil	595.49	508.2	492.1	570.49			
Moisture Content (%)	11.14%	18.15%	19.42%	26.21%			
Dry Unit Weight (pcf)	85.4	87.8	90.7	87.9			

Comments:

Tony Summers
 Technician Name

Anthony M. Summers
 Signature

AMRL - N/A
 Certification Type/No.

4/26/2013
 Date

David A. Bixler II, PE
 Technical Responsibility

David A. Bixler II
 Signature

Sr. Project Engineer
 Position

4/26/2013
 Date

Form ESP-L-01.04__Rev. 03__7/24/09

Moisture-Density Relationship

Cells 1 & 2 Operations Laboratory Test Results



Moisture - Density Report

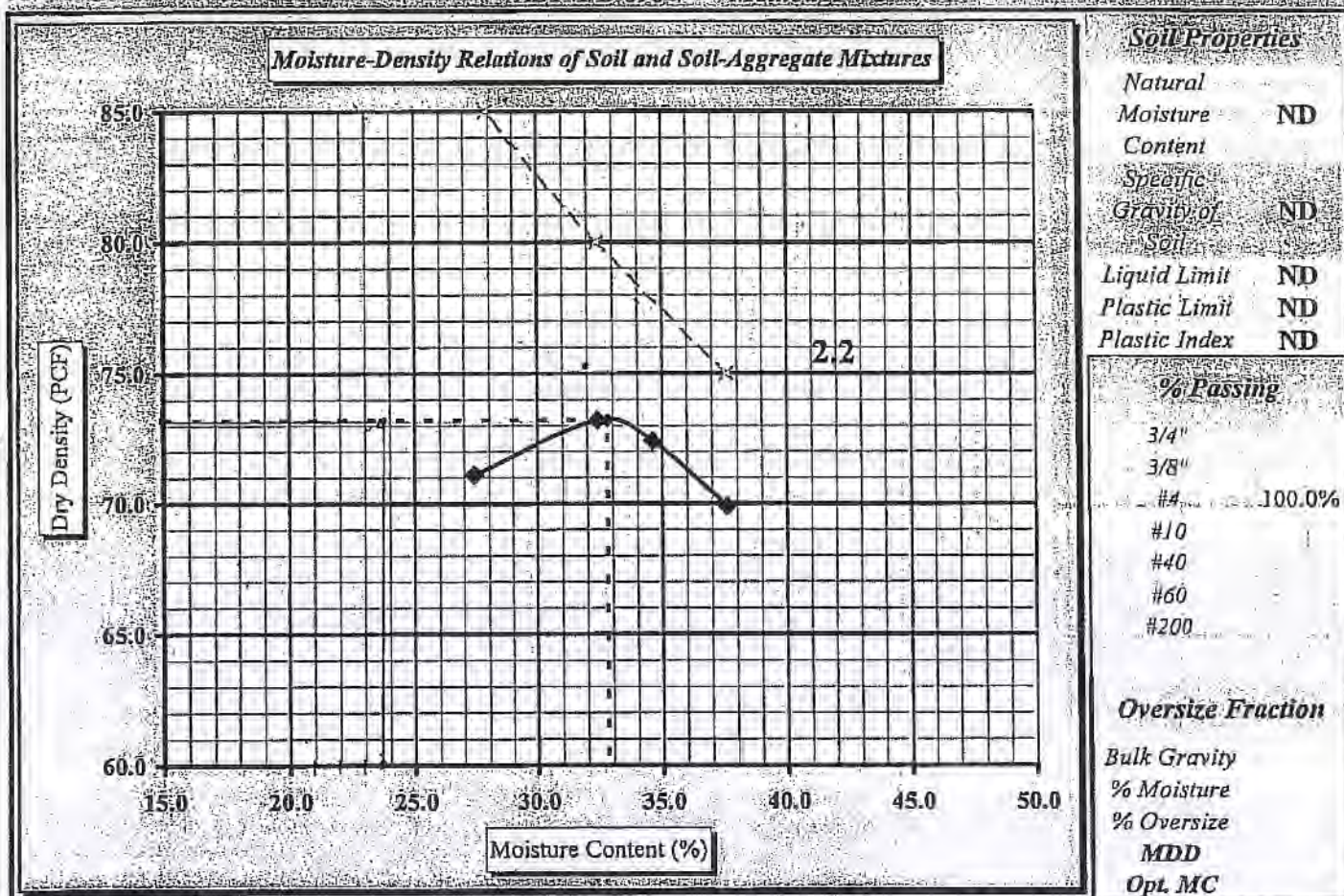


Quality Assurance

S&ME, Inc. - 9751 Southern Pine Boulevard - Charlotte, NC 28273

S&ME Project #:	1356-11-016	Phase 1	Report Date:	8/24/11	
Project Name:	Marshall Steam Station-Landfill Testing Services		Test Date(s):	8/22-24/11	
Client Name:	Duke Energy				
Client Address:	Terrell, NC				
Boring #:	NA	Sample #:	S-1	Sample Date:	8/10/2011
Location:	Cell 2-D9	Offset:	NA	Depth:	Bulk
Sample Description:	Fly Ash				

Maximum Dry Density 73.2 PCF Optimum Moisture Content 32.8%
ASTM D 698 Method A



Moisture-Density Curve Displayed: Fine Fraction ☒ Corrected for Oversize Fraction (ASTM D 4718) ☐
 Sieve Size used to separate the Oversize Fraction: #4 Sieve ☒ 3/8 inch Sieve ☐ 3/4 inch Sieve ☐
 Mechanical Rammer ☒ Manual Rammer ☐ Moist Preparation ☒ Dry Preparation ☐

References / Comments / Deviations:

Oven Temperature set at 60°C

ASTM D 2216 Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass

ASTM D 698 Laboratory Compaction Characteristics of Soil Using Standard Effort

William Harrison
Technical Responsibility

Will A. R.
Signature

Staff Professional
Position

1-18-12
Date

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Moisture - Density Relationship

ASTM D558, D698, D1557, AASHTO T99, T180

Quality Assurance

S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273

Project #:	1356-11-016	Phase 1	Report Date:	8/24/11
Project Name:	Marshall Steam Station-Landfill Testing Services		Test Date(s)	8/22-24/11
Client Name:	Duke Energy			
Project Address:	Terrell, NC			
Boring #:	NA	Sample #:	S-1	Sample Date:
Location:	Cell 2-D9	Offset:	NA	Depth:
Sample Description:	Fly Ash			
Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #
Balance (0.1 g)	22182	6/8/2011	Compaction Mold	20231
Balance	22182	6/8/2011	Compaction Hammer	20222
Straightedge	20124	6/15/2011	Oven	10844
Sieve	3599	4/12/2011		

Water Content		Water Content requires GP 2 Balance (0.1 gram Readability).				Check:	
ASTM D2216 <input checked="" type="checkbox"/>		AASHTO T265 <input type="checkbox"/>		ASTM D4959 <input type="checkbox"/>		ASTM D4643 <input type="checkbox"/>	
Water Added:							
Tare #:		EL	JLG	MDJ	G	JRC	B
A. Tare Weight	A.	161.5	162.5	180.0	157.4	156.0	156.7
B. Wet Wt + Tare Wt	B.	726.0	870.6	672.5	704.2	680.0	988.7
C. Dry Wt. + Tare Wt.	C.	631.7	731.1	566.7	569.2	545.3	761.3
D. Water Weight	B-C	94.3	139.5	105.8	135.0	134.7	227.4
E. Dry Weight	C-A	470.2	568.6	386.7	411.8	389.3	604.6
F. Moisture Content	100*D/E	20.1%	24.5%	27.4%	32.8%	34.6%	37.6%

Compaction Data		Requires a GP 5 Balance for ASTM (1 gram or .0022 Lb. readability).				Check:	
ASTM D558 <input type="checkbox"/>		ASTM D 698 <input checked="" type="checkbox"/>		ASTM D1557 <input type="checkbox"/>		AASHTO T99 <input type="checkbox"/>	
Method A <input checked="" type="checkbox"/>		Method B <input type="checkbox"/>		Method C <input type="checkbox"/>		Method D (ASTM 1978) <input type="checkbox"/>	
AASHTO T180 <input type="checkbox"/>		AASHTO Method D <input type="checkbox"/>					
G. Wt of Soil + Mold	G.	5520	5579	5617	5711	5780	5700
H. Wt. of Mold	H.	4254	4254	4254	4254	4254	4254
I. Wt. of Soil (g. or lbs.)	G-H	1266	1325	1363	1457	1526	1446
J. Wt of Soil (Lbs.)	I/453.6 or I	2.791	2.921	3.005	3.212	3.364	3.188
K. Mold Volume Factor	K.	30.16	30.16	30.16	30.16	30.16	30.16
L. Wet Density (PCF)	J*K	84.2	88.1	90.6	96.9	101.5	96.2
M. Dry Density (PCF)	L/(1+F)	70.1	70.8	71.1	73.0	75.4	69.9
Sieve Size used to separate the Oversize Fraction:		#4 Sieve <input checked="" type="checkbox"/>		3/8 inch Sieve <input type="checkbox"/>		3/4 inch Sieve <input type="checkbox"/>	
Mechanical Rammer <input checked="" type="checkbox"/>		Manual Rammer <input type="checkbox"/>		Moist Preparation <input checked="" type="checkbox"/>		Dry Preparation <input type="checkbox"/>	

References / Comments / Deviations: ASTM D 4318, D 854, D 2487, C 127**Oven Temperature Set at 60C**

Karen Warner
Technician Name

Karen Warner
Signature

NICET 117900
Certification Type/No.

8/24/2011
Date

William Harrison
Technical Responsibility

William Harrison
Signature

Staff Professional
Position

1/24/12
Date

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Moisture - Density Report



Quality Assurance

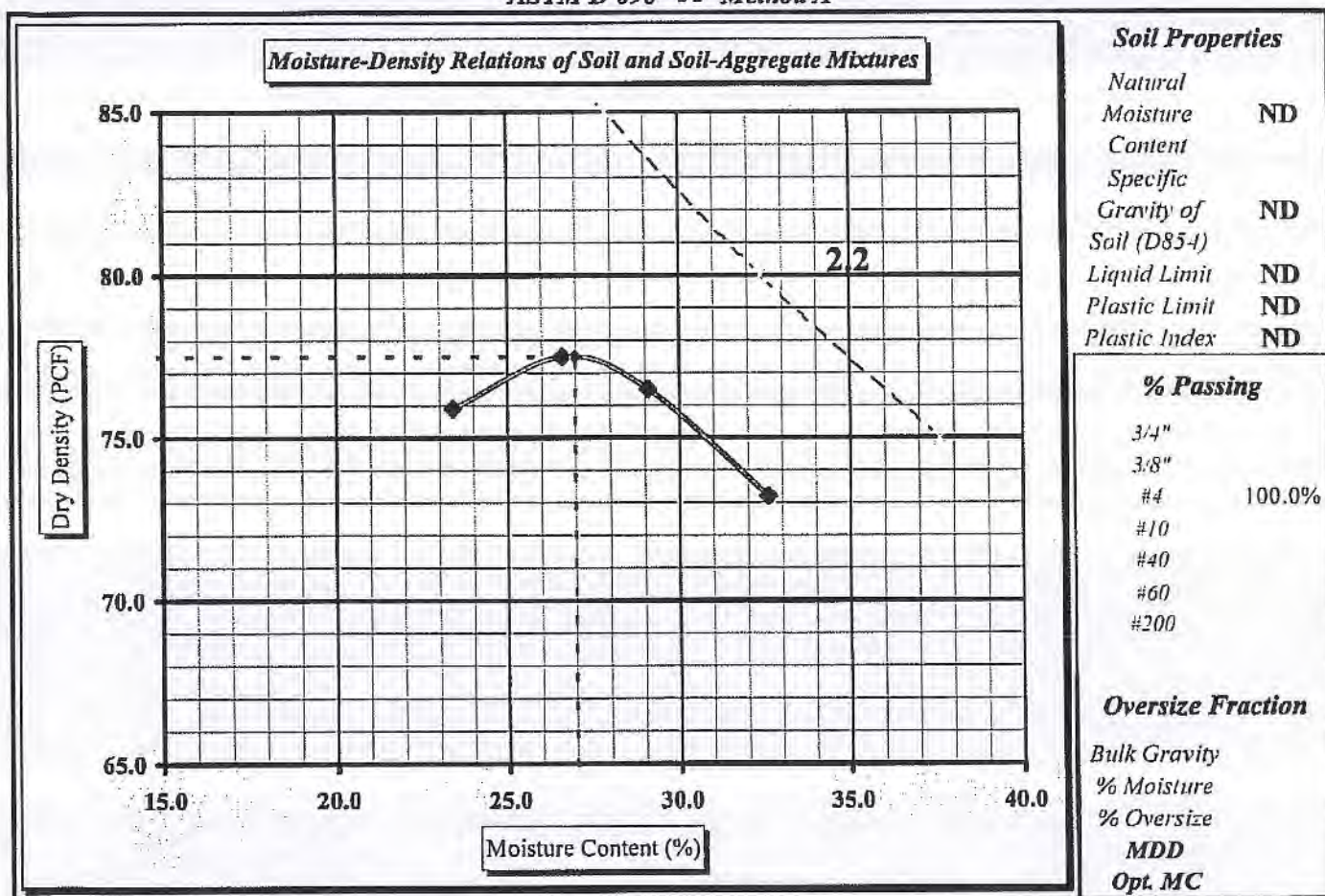
S&ME, Inc.~ 9751 Southern Pine Boulevard~Charlotte, NC 28273

S&ME Project #:	1356-11-016	Phase 1		Report Date:	9/26/11
Project Name:	Marshall Steam Station - Landfill Testing Services			Test Date(s):	9/19-26/11
Client Name:	Duke Energy			Amended Report	
Client Address:	Charlotte, NC				
Boring #:	NA	Sample #:	S-2	Sample Date:	9/8/2011
Location:	Cell 2-F12	Offset:	NA	Depth:	NA
Sample Description:	Fly Ash				

Maximum Dry Density 77.5 PCF.

Optimum Moisture Content 27.0%

ASTM D 698 -- Method A



Moisture-Density Curve Displayed: Fine Fraction ☒ Corrected for Oversize Fraction (ASTM D 4718) ☐
 Sieve Size used to separate the Oversize Fraction: #4 Sieve ☒ 3/8 inch Sieve ☐ 3/4 inch Sieve ☐
 Mechanical Rammer ☒ Manual Rammer ☐ Moist Preparation ☐ Dry Preparation ☒

References / Comments / Deviations: ASTM D 854: Specific Gravity of Soils

Oven Temperature Set at 60C.

ASTM D 2216: Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass

ASTM D 698: Laboratory Compaction Characteristics of Soil Using Standard Effort

William Harrison

Technical Responsibility

Signature

Project Engineer

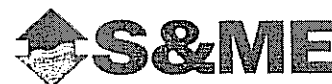
Position

1-18-12

Date

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Moisture - Density Relationship



ASTM D558, D698, D1557, AASHTO T99, T180

Quality Assurance

S&ME, Inc.~ 9751 Southern Pine Boulevard~Charlotte, NC 28273

Project #:	1356-11-016	Phase 1	Report Date:	9/26/11
Project Name:	Marshall Steam Station - Landfill Testing Services		Test Date(s)	9/19-26/11
Client Name:	Duke Energy		Amended Report	
Client Address:	Charlotte, NC			
Boring #:	NA	Sample #:	S-2	Sample Date:
Location:	Cell 2-F12	Offset:	NA	Depth:
Sample Description:	Fly Ash			
Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #
Balance (0.1 g)	22182	6/8/2011	Compaction Mold	20231
Balance	22182	6/8/2011	Compaction Hammer	20222
Straightedge	20124	6/15/2011	Oven	10844
Sieve	3599	4/12/2011		

Water Content		Water Content requires GP 2 Balance (0.1 gram Readability).				Check:	
ASTM D2216 <input checked="" type="checkbox"/>		AASHTO T265 <input type="checkbox"/>		ASTM D4959 <input type="checkbox"/>		ASTM D4643 <input type="checkbox"/>	
Water Added:							
Tare #:			JLG	PTL	JRC	G	
A. Tare Weight	A.		163.0	168.3	156.6	157.5	
B. Wet Wt + Tare Wt	B.		799.2	775.0	756.7	771.9	
C. Dry Wt. + Tare Wt.	C.		678.5	647.5	621.5	620.9	
D. Water Weight	B-C		120.7	127.5	135.2	151.0	
E. Dry Weight	C-A		515.5	479.2	464.9	463.4	
F. Moisture Content	100*D/E		23.4%	26.6%	29.1%	32.6%	
Compaction Data		Requires a GP 5 Balance for ASTM (1 gram or .0022 Lb. readability).				Check: 1000/1000	
ASTM D558 <input type="checkbox"/>		ASTM D 698 <input checked="" type="checkbox"/>		ASTM D1557 <input type="checkbox"/>		AASHTO T99 <input type="checkbox"/>	
Method A <input checked="" type="checkbox"/>		Method B <input type="checkbox"/>		Method C <input type="checkbox"/>		Method D (ASTM 1978) <input type="checkbox"/>	
G. Wt of Soil + Mold		G.		5661	5728	5738	5714
H. Wt. of Mold		H.		4253	4253	4253	4253
I. Wt. of Soil (g. or lbs.)		G-H		1408	1475	1485	1461
J. Wt of Soil (Lbs.)		I/453.6 or I		3.104	3.252	3.274	3.221
K. Mold Volume Factor		K.		30.16	30.16	30.16	30.16
L. Wet Density (PCF)		J*K		93.6	98.1	98.7	97.1
M. Dry Density (PCF)		L/(1+F)		75.9	77.5	76.5	73.2
Sieve Size used to separate the Oversize Fraction:		#4 Sieve <input checked="" type="checkbox"/>		3/8 inch Sieve <input type="checkbox"/>		3/4 inch Sieve <input type="checkbox"/>	
Mechanical Rammer <input checked="" type="checkbox"/>		Manual Rammer <input type="checkbox"/>		Moist Preparation <input type="checkbox"/>		Dry Preparation <input checked="" type="checkbox"/>	

References / Comments / Deviations: AASTM D 4318, D 854, D 2487, C 127

Oven Temperature Set at 60C.

Karen Warner
Technician Name

Signature
NICET 117900
Certification Type/No.9/26/2011
DateWilliam Harrison
Technical Responsibility

Signature
Project Engineer
Position1/24/12
Date

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Moisture - Density Report



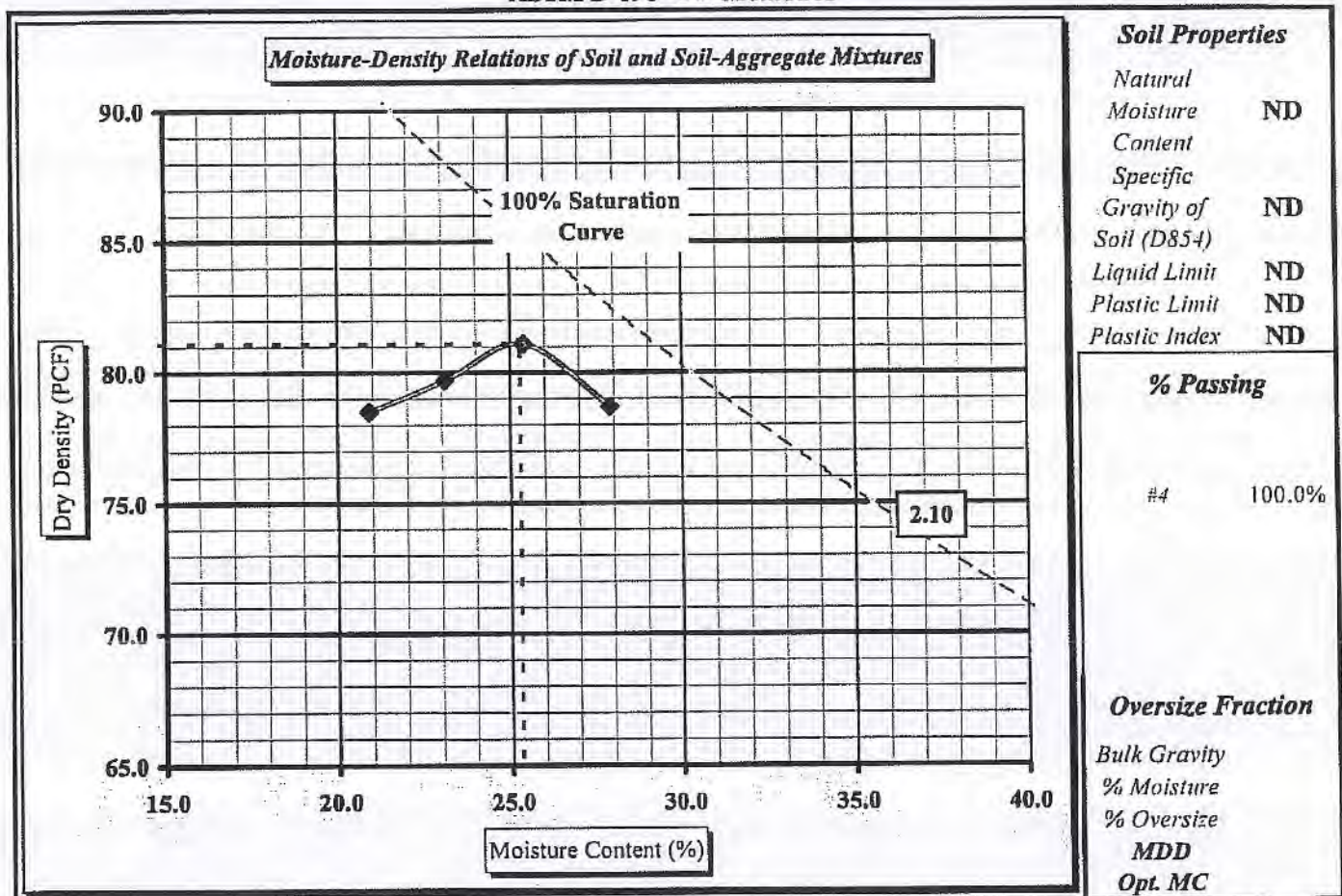
Quality Assurance

S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273

S&ME Project #:	1356-11-016 Ph. 1	Report Date:	10/26-31/11
Project Name:	Marshall Steam Station - Landfill Testing Services	Test Date(s):	10/31/11
Client Name:	Duke Energy		
Client Address:	Charlotte, NC		
Boring #:	NI	Sample #:	3
Location:	Cell 2 - A110	Offset:	NI
Sample Description:	Fly Ash	Sample Date:	10/20/2011
		Depth:	NI

Maximum Dry Density 81.1 PCF. Optimum Moisture Content 25.3%

ASTM D 698 -- Method A



Moisture-Density Curve Displayed: Fine Fraction ☒ Corrected for Oversize Fraction (ASTM D 4718) ☐
 Sieve Size used to separate the Oversize Fraction: #4 Sieve ☒ 3/8 inch Sieve ☐ 3/4 inch Sieve ☐
 Mechanical Rammer ☒ Manual Rammer ☐ Moist Preparation ☐ Dry Preparation ☒
 References / Comments / Deviations: *ND = Not determined *NI = Information was not provided

ASTM D 2216: Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass

ASTM D 698: Laboratory Compaction Characteristics of Soil Using Standard Effort

William Harrison

Technical Responsibility

Signature

Staff Eng. II

Position

1-18-12

Date

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Moisture - Density Relationship



ASTM D558, D698, D1557, AASHTO T99, T180

Quality Assurance

S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273

Project #:	1356-11-016 Ph. 1			Report Date:	10/26-31/11
Project Name:	Marshall Steam Station - Landfill Testing Services			Test Date(s)	10/31/11
Client Name:	Duke Energy				
Client Address:	Charlotte, NC				
Boring #:	NI	Sample #:	3	Sample Date:	10/20/2011
Location:	Cell 2 - A110	Offset:	NI	Depth:	NI
Sample Description:	Fly Ash				
Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #	Cal Date:
Balance (0.1 g)	22182	6/8/2011	Compaction Mold	20231	12/29/2010
Balance	22182	6/8/2011	Compaction Hammer	20222	6/6/2011
Straightedge	20124	6/15/2011	Oven	22151	10/4/2011
Sieve #4	10939	10/4/2011			

Water Content		Water Content requires GP 2 Balance (0.1 gram Readability).				Check:	
ASTM D2216 <input checked="" type="checkbox"/>		AASHTO T265 <input type="checkbox"/>		ASTM D4959 <input type="checkbox"/>		ASTM D4643 <input type="checkbox"/>	
	Water Added:	300	250	200	150	350	Natural
	Tare #:	G	18	699	DLB	PTL	
A. Tare Weight	A.	157.8	158.6	155.0	160.3	169.2	
B. Wet Wt + Tare Wt	B.	944.3	985.8	1071.8	989.5	1685.0	
C. Dry Wt. + Tare Wt.	C.	772.5	818.5	899.8	846.1	1331.5	
D. Water Weight	B-C	171.8	167.3	172.0	143.4	353.5	
E. Dry Weight	C-A	614.7	659.9	744.8	685.8	1162.3	
F. Moisture Content	100*D/E	27.9%	25.4%	23.1%	20.9%	30.4%	
Compaction Data		Requires a GP 5 Balance for ASTM (1 gram or .0022 Lb. readability).				Check:	
ASTM D558 <input type="checkbox"/>		ASTM D 698 <input checked="" type="checkbox"/>		ASTM D1557 <input type="checkbox"/>		AASHTO T99 <input type="checkbox"/>	
Method A <input checked="" type="checkbox"/>		Method B <input type="checkbox"/>		Method C <input type="checkbox"/>		Method D (ASTM 1978) <input type="checkbox"/>	
						AASHTO T180 <input type="checkbox"/>	
						AASHTO Method D <input type="checkbox"/>	
G. Wt of Soil + Mold	G.	5766	5782	5727	5679	5778	
H. Wt. of Mold	H.	4252	4252	4252	4252	4252	
I. Wt. of Soil (g. or lbs.)	G-H	1514	1530	1475	1427	1526	
J. Wt of Soil (Lbs.)	1/453.6 or I	3.338	3.373	3.252	3.146	3.364	
K. Mold Volume Factor	K.	30.16	30.16	30.16	30.16	30.16	
L. Wet Density (PCF)	J*K	100.7	101.7	98.1	94.9	101.5	
M. Dry Density (PCF)	L/(1+F)	78.7	81.1	79.7	78.5	77.8	
Sieve Size used to separate the Oversize Fraction: #4 Sieve <input checked="" type="checkbox"/> 3/8 inch Sieve <input type="checkbox"/> 3/4 inch Sieve <input type="checkbox"/>							
Mechanical Rammer <input checked="" type="checkbox"/> Manual Rammer <input type="checkbox"/> Moist Preparation <input type="checkbox"/> Dry Preparation <input checked="" type="checkbox"/>							

References / Comments / Deviations: *ND = Not determined *NI = Information was not provided

Jennifer Olsen
Technician Name

Jennifer Olsen
Signature

NICET/117926
Certification Type/No.

10/31/2011
Date

William Harrison
Technical Responsibility

William Harrison
Signature

Project Engineer
Position

1/24/12
Date

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Moisture - Density Report



Quality Assurance

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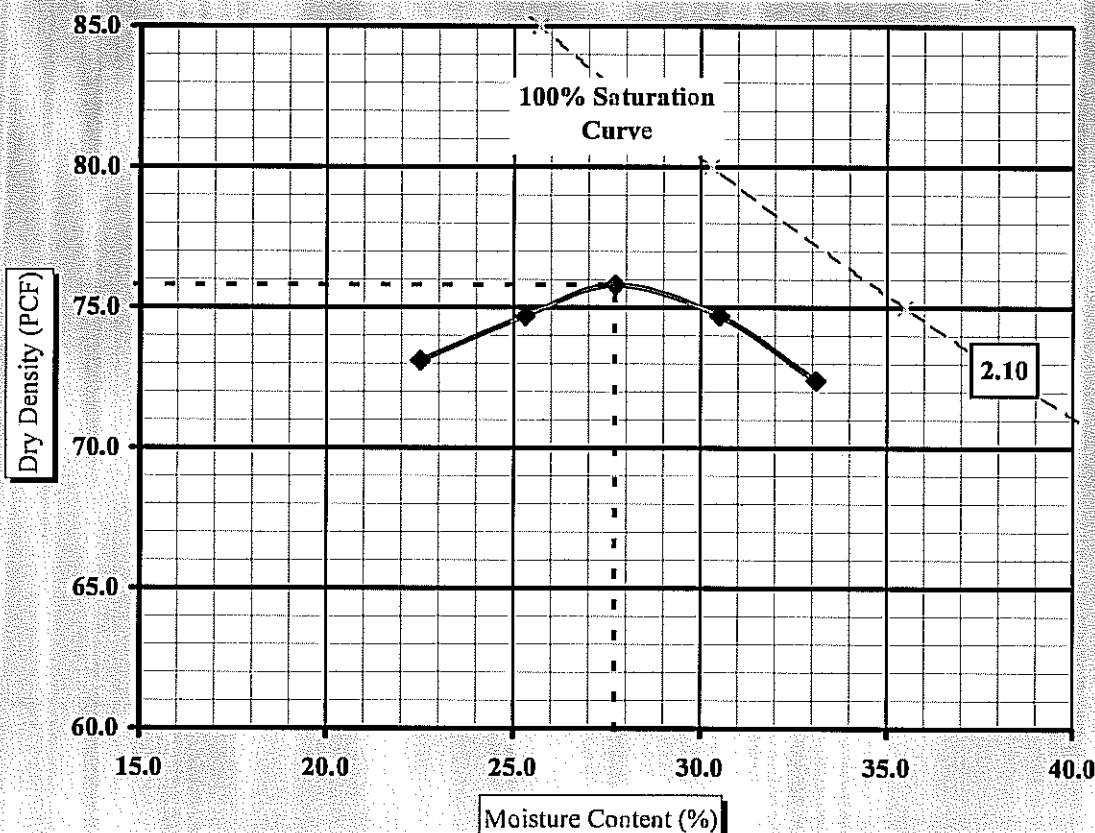
S&ME Project #:	1356-11-016 Ph. 1	Report Date:	1/6/12
Project Name:	Marshall Steam Station - Landfill Testing Services	Test Date(s):	1/4-6/12
Client Name:	Duke Energy		
Client Address:	Charlotte, NC		
Boring #:	NI	Sample #:	S-4
		Sample Date:	12/2/2011
Location:	Cell 2 - Sample 4	Offset:	NI
		Depth:	NI
Sample Description:	Black Fly Ash		

Maximum Dry Density 75.8 PCF.

Optimum Moisture Content 27.7%

ASTM D 698 -- Method A

Moisture-Density Relations of Soil and Soil-Aggregate Mixtures



Soil Properties

Natural Moisture Content ND

Specific Gravity of Soil (D854) ND

Liquid Limit ND

Plastic Limit ND

Plastic Index ND

% Passing

3/4"	
3/8"	
#4	100.0%
#10	
#20	
#40	
#200	

Oversize Fraction

Bulk Gravity
% Moisture
% Oversize
MDD
Opt. MC

Moisture-Density Curve Displayed: Fine Fraction ☒ Corrected for Oversize Fraction (ASTM D 4718) ☐
 Sieve Size used to separate the Oversize Fraction: #4 Sieve ☒ 3/8 inch Sieve ☐ 3/4 inch Sieve ☐
 Mechanical Rammer ☒ Manual Rammer ☐ Moist Preparation ☐ Dry Preparation ☒

References / Comments / Deviations: *ND = Not determined *NI = Information was not provided

ASTM D 2216: Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass

ASTM D 698: Laboratory Compaction Characteristics of Soil Using Standard Effort

William Harrison

Technical Responsibility

William Harrison (Signature)

Signature

Project Engineer

Position

1/24/12

Date

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Moisture - Density Relationship



ASTM D558, D698, D1557, AASHTO T99, T180

Quality Assurance

S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273

Project #:	1356-11-016 Ph. 1			Report Date:	1/6/12		
Project Name:	Marshall Steam Station - Landfill Testing Services			Test Date(s)	1/4-6/12		
Client Name:	Duke Energy						
Client Address:	Charlotte, NC						
Boring #:	N1	Sample #:	S-4	Sample Date:	12/2/2011		
Location:	Cell 2 - Sample 4	Offset:	N1	Depth:	N1		
Sample Description:	Black Fly Ash						
Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #	Cal Date:		
Balance (0.1 g)	22182	6/8/2011	Compaction Mold	20231	12/29/2010		
Balance	22182	6/8/2011	Compaction Hammer	20222	6/6/2011		
Straightedge	20124	6/15/2011	Oven	22151	10/4/2011		
Sieve #4	10939	10/4/2011					
Water Content							
Water Content requires GP 2 Balance (0.1 gram Readability).							
ASTM D2216 <input checked="" type="checkbox"/>		AASHTO T265 <input type="checkbox"/>		ASTM D4959 <input type="checkbox"/>		Check: ASTM D4643 <input type="checkbox"/>	
Water Added:		200	250	300	350	400	Redo 200
Tare #:		5I	KO	EL	698	699	KBM
A. Tare Weight	A.	162.2	164.8	164.7	153.8	155.1	153.9
B. Wet Wt + Tare Wt	B.	732.9	923.4	993.9	882.8	885.0	953.0
C. Dry Wt. + Tare Wt.	C.	627.6	770.0	813.9	712.6	703.4	806.3
D. Water Weight	B-C	105.3	153.4	180.0	170.2	181.6	146.7
E. Dry Weight	C-A	465.4	605.2	649.2	558.8	548.3	652.4
F. Moisture Content	100*D/E	22.6%	25.3%	27.7%	30.5%	33.1%	22.5%
Compaction Data							
Requires a GP 5 Balance for ASTM (1 gram or .0022 Lb. readability).							
ASTM D558 <input type="checkbox"/>		ASTM D 698 <input checked="" type="checkbox"/>		ASTM D1557 <input type="checkbox"/>		AASHTO T99 <input type="checkbox"/>	
Method A <input checked="" type="checkbox"/>		Method B <input type="checkbox"/>		Method C <input type="checkbox"/>		Method D (ASTM 1978) <input type="checkbox"/>	
AASHTO T180 <input type="checkbox"/>		AASHTO Method D <input type="checkbox"/>					
G. Wt of Soil + Mold	G.	5621	5660	5707	5719	5702	5600
H. Wt. of Mold	H.	4252	4252	4252	4252	4252	4252
I. Wt. of Soil (g. or lbs.)	G-H	1369	1408	1455	1467	1450	1348
J. Wt of Soil (Lbs.)	1/453.6 or I	3.018	3.104	3.208	3.234	3.197	2.972
K. Mold Volume Factor	K.	30.16	30.16	30.16	30.16	30.16	30.16
L. Wet Density (PCF)	J*K	91.0	93.6	96.8	97.5	96.4	89.6
M. Dry Density (PCF)	L/(1+F)	74.2	74.7	75.8	74.7	72.4	73.1
Sieve Size used to separate the Oversize Fraction: #4 Sieve <input checked="" type="checkbox"/> 3/8 inch Sieve <input type="checkbox"/> 3/4 inch Sieve <input type="checkbox"/>							
Mechanical Rammer <input checked="" type="checkbox"/> Manual Rammer <input type="checkbox"/> Moist Preparation <input type="checkbox"/> Dry Preparation <input checked="" type="checkbox"/>							

References / Comments / Deviations: *ND = Not determined *NI = Information was not provided

Jennifer Olsen
Technician Name

Signature
NICET/117926
Certification Type/No.1/6/2012
DateWilliam Harrison
Technical Responsibility

Signature
Project Engineer
Position1/24/12
Date

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Moisture - Density Report



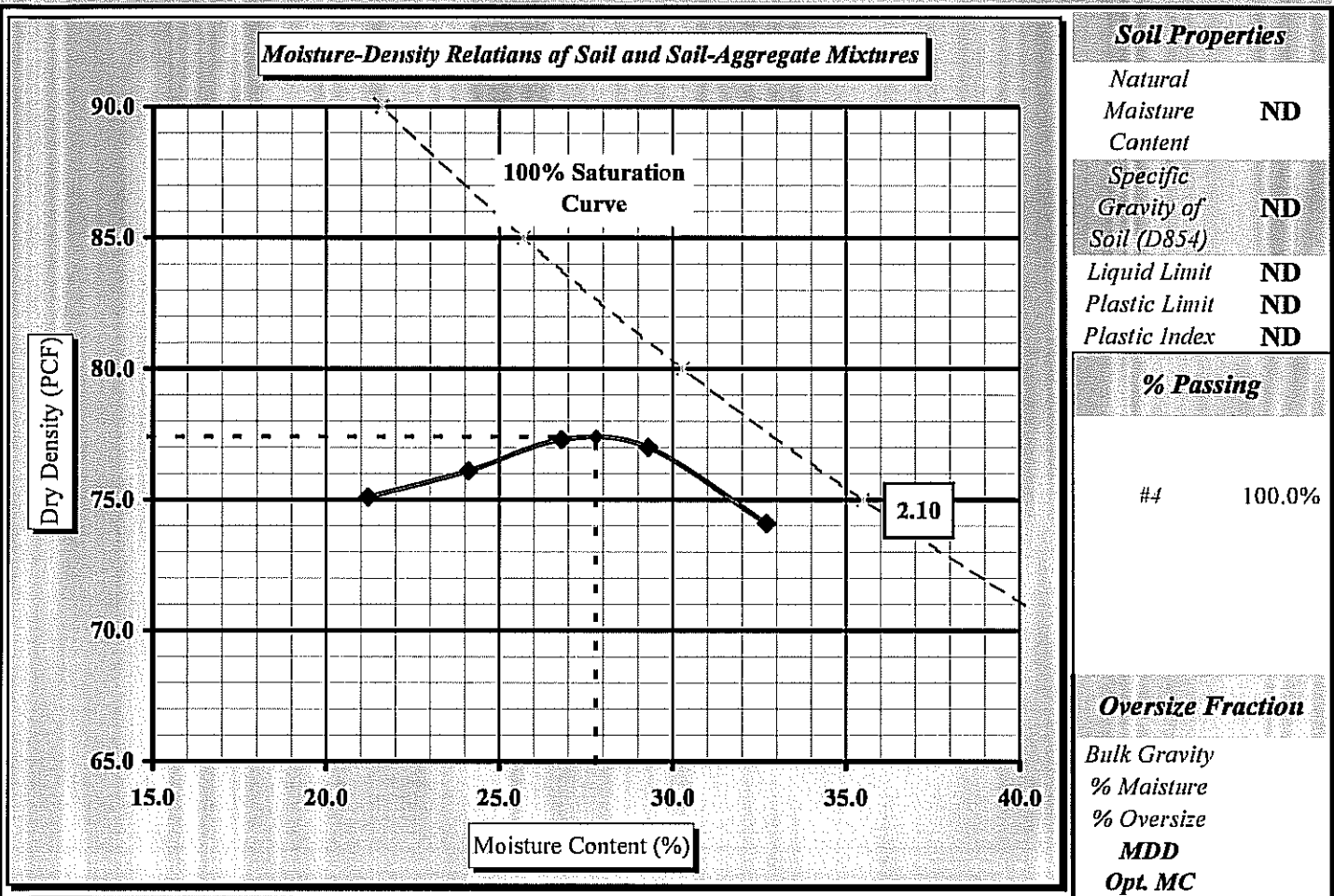
Quality Assurance

S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273

S&ME Project #:	1356-11-016 Ph. 1	Report Date:	1/23/12
Project Name:	Marshall Steam Station - Landfill Testing Services	Test Date(s):	1/19-23/12
Client Name:	Duke Energy		
Client Address:	Charlotte, NC		
Boring #:	NI	Sample #:	S-5
		Sample Date:	1/12/2012
Location:	Cells 1/2	Offset:	NI
		Depth:	NI
Sample Description:	Black Fly Ash		

Maximum Dry Density 77.4 PCF. Optimum Moisture Content 27.8%

ASTM D 698 -- Method A



Moisture-Density Curve Displayed: Fine Fraction ☒ Corrected for Oversize Fraction (ASTM D 4718) ☐
 Sieve Size used to separate the Oversize Fraction: #4 Sieve ☒ 3/8 inch Sieve ☐ 3/4 inch Sieve ☐
 Mechanical Rammer ☒ Manual Rammer ☐ Moist Preparation ☐ Dry Preparation ☒

References / Comments / Deviations: *ND = Not determined *NI = Information was not provided

ASTM D 2216: Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass

ASTM D 698: Laboratory Compaction Characteristics of Soil Using Standard Effort

Kyle Bancom
Technical Responsibility

Kyle Bancom
Signature

Staff Professional
Position

1/23/12
Date

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Moisture - Density Relationship



ASTM D558, D698, D1557, AASHTO T99, T180

Quality Assurance

S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273

Project #:	1356-11-016 Ph. 1		Report Date:	1/23/12	
Project Name:	Marshall Steam Station - Landfill Testing Services		Test Date(s)	1/19-23/12	
Client Name:	Duke Energy				
Client Address:	Charlotte, NC				
Boring #:	NI	Sample #:	S-5	Sample Date:	1/12/2012
Location:	Cells 1/2	Offset:	NI	Depth:	NI
Sample Description:	Black Fly Ash				
Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #	Cal Date:
Balance (0.1 g)	22182	6/8/2011	Compaction Mold	20231	1/6/2012
Balance	22182	6/8/2011	Compaction Hammer	20222	6/6/2011
Straightedge	20124	1/17/2012	Oven	22151	10/4/2011
Sieve #4	10939	10/4/2011			
Water Content Water Content requires GP 2 Balance (0.1 gram Readability). Check:					
ASTM D2216 <input checked="" type="checkbox"/>		AASHTO T265 <input type="checkbox"/>		ASTM D4959 <input type="checkbox"/>	
ASTM D4643 <input type="checkbox"/>					
Water Added:	150	100	50	As Is	200
Tare #:	KBM	5I	DMJ	GH	SR
A. Tare Weight	A.	154.1	162.6	164.5	163.5
B. Wet Wt + Tare Wt	B.	890.5	1031.9	964.9	1011.5
C. Dry Wt. + Tare Wt.	C.	723.7	848.1	809.6	863.3
D. Water Weight	B-C	166.8	183.8	155.3	148.2
E. Dry Weight	C-A	569.6	685.5	645.1	699.8
F. Moisture Content	100*D/E	29.3%	26.8%	24.1%	21.2%
Compaction Data Requires a GP 5 Balance for ASTM (1 gram or .0022 Lb. readability). Check:					
ASTM D558 <input type="checkbox"/>		ASTM D 698 <input checked="" type="checkbox"/>		ASTM D1557 <input type="checkbox"/>	
ASTM D 1557 <input type="checkbox"/>		AASHTO T99 <input type="checkbox"/>		AASHTO T180 <input type="checkbox"/>	
Method A <input checked="" type="checkbox"/>		Method B <input type="checkbox"/>		Method C <input type="checkbox"/>	
Method D (ASTM 1978) <input type="checkbox"/>		AASHTO Method D <input type="checkbox"/>			
G. Wt of Soil + Mold	G.	5753	5730	5677	5624
H. Wt. of Mold	H.	4252	4252	4252	4252
I. Wt. of Soil (g. or lbs.)	G-H	1501	1478	1425	1372
J. Wt of Soil (Lbs.)	1/453.6 or I	3.309	3.258	3.142	3.025
K. Mold Volume Factor	K.	30.09	30.09	30.09	30.09
L. Wet Density (PCF)	J*K	99.6	98.0	94.5	91.0
M. Dry Density (PCF)	L/(1+F)	77.0	77.3	76.1	75.1
Sieve Size used to separate the Oversize Fraction: #4 Sieve <input checked="" type="checkbox"/> 3/8 inch Sieve <input type="checkbox"/> 3/4 inch Sieve <input type="checkbox"/>					
Mechanical Rammer <input checked="" type="checkbox"/> Manual Rammer <input type="checkbox"/> Moist Preparation <input type="checkbox"/> Dry Preparation <input checked="" type="checkbox"/>					

References / Comments / Deviations: *ND = Not determined *NI = Information was not provided

Jennifer Olsen
Technician Name

Signature
NICET/117926
Certification Type/No.1/23/2012
DateKyle Baucom
Technical Responsibility

Signature
Staff Professional
Position1/23/12
Date

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Moisture - Density Report



Quality Assurance

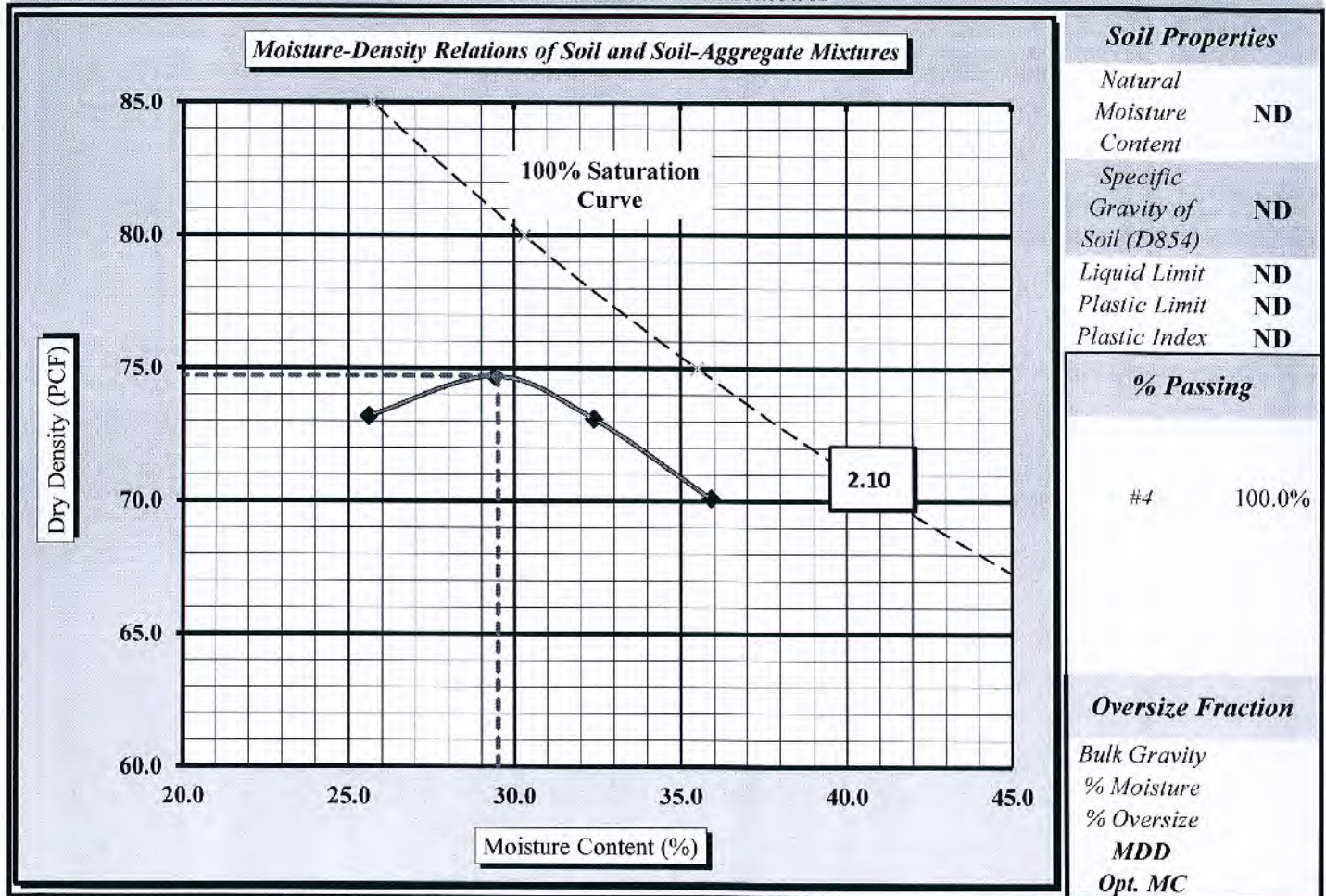
S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273

S&ME Project #:	1356-11-016 Ph. 02 of 13	Report Date:	4/23/12
Project Name:	Marshall Ind. Landfill No. 1 - Cells 1 & 2 Operations	Test Date(s):	4/16-23/12
Client Name:	Duke Energy		
Client Address:	526 South Church Street, Charlotte, NC 28202		
Boring #:	NI	Sample #:	6
		Sample Date:	3/12/2012
Location:	Grid B14	Offset:	NI
		Depth:	NI
Sample Description:	Fly Ash		

Maximum Dry Density 74.7 PCF.

Optimum Moisture Content 29.5%

ASTM D 698 -- Method A



Moisture-Density Curve Displayed: Fine Fraction ☒ Corrected for Oversize Fraction (ASTM D 4718) ☐
 Sieve Size used to separate the Oversize Fraction: #4 Sieve ☒ 3/8 inch Sieve ☐ 3/4 inch Sieve ☐
 Mechanical Rammer ☒ Manual Rammer ☐ Moist Preparation ☒ Dry Preparation ☐

References / Comments / Deviations: *ND = Not determined *NI = Information was not provided

ASTM D 2216: Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass

ASTM D 698: Laboratory Compaction Characteristics of Soil Using Standard Effort

Kyle Baucom
Technical Responsibility

Kyle Baucom
Signature

Project Engineer
Position

4/23/12
Date

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Moisture - Density Relationship



ASTM D558, D698, D1557, AASHTO T99, T180

Quality Assurance

S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273

Project #:	1356-11-016 Ph. 02 01 K3	Report Date:	4/23/12
Project Name:	Marshall Ind. Landfill No. 1 - Cells 1 & 2 Operations	Test Date(s)	4/16-23/12
Client Name:	Duke Energy		
Client Address:	526 South Church Street, Charlotte, NC 28202		
Boring #:	NI	Sample #:	6
Location:	Grid B14	Offset:	NI
Sample Description:	Fly Ash	Sample Date:	3/12/2012
Depth:		Depth:	NI

Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #	Cal Date:
Balance (0.1 g)	22182	6/8/2011	Compaction Mold	20231	1/6/2012
Balance	22182	6/8/2011	Compaction Hammer	20222	6/6/2011
Straightedge	20124	1/17/2012	Oven	22151	3/23/2012
Sieve #4	10939	10/4/2011			

Water Content		Water Content requires GP 2 Balance (0.1 gram Readability).				Check:	
ASTM D2216 <input checked="" type="checkbox"/>		AASHTO T265 <input type="checkbox"/>		ASTM D4959 <input type="checkbox"/>		ASTM D4643 <input type="checkbox"/>	
Water Added:		300	250	200	150	300	
Tare #:		5F	5I	G	5C	KH	
A. Tare Weight	A.	158.2	163.5	158.5	157.1	158.8	
B. Wet Wt + Tare Wt	B.	969.9	1097.2	1056.6	1028.6	1126.4	
C. Dry Wt. + Tare Wt.	C.	771.1	877.6	852.3	850.7	870.9	
D. Water Weight	B-C	198.8	219.6	204.3	177.9	255.5	
E. Dry Weight	C-A	612.9	714.1	693.8	693.6	712.1	
F. Moisture Content	100*D/E	32.4%	30.8%	29.4%	25.6%	35.9%	
Compaction Data		Requires a GP 5 Balance for ASTM (1 gram or .0022 Lb. readability).				Check:	
ASTM D558 <input type="checkbox"/>		ASTM D 698 <input checked="" type="checkbox"/>		ASTM D1557 <input type="checkbox"/>		AASHTO T99 <input type="checkbox"/>	
Method A <input checked="" type="checkbox"/>		Method B <input type="checkbox"/>		Method C <input type="checkbox"/>		Method D (ASTM 1978) <input type="checkbox"/>	
						AASHTO T180 <input type="checkbox"/>	
						AASHTO Method D <input type="checkbox"/>	
G. Wt of Soil + Mold	G.	5708	5725	5707	5634	5685	
H. Wt. of Mold	H.	4249	4249	4249	4249	4249	
I. Wt. of Soil (g. or lbs.)	G-H	1459	1476	1458	1385	1436	
J. Wt of Soil (Lbs.)	1/453.6 or I	3.216	3.254	3.214	3.053	3.166	
K. Mold Volume Factor	K.	30.09	30.09	30.09	30.09	30.09	
L. Wet Density (PCF)	J*K	96.8	97.9	96.7	91.9	95.3	
M. Dry Density (PCF)	L/(1+F)	73.1	74.8	74.7	73.2	70.1	
Sieve Size used to separate the Oversize Fraction:		#4 Sieve <input checked="" type="checkbox"/>		3/8 inch Sieve <input type="checkbox"/>		3/4 inch Sieve <input type="checkbox"/>	
Mechanical Rammer <input checked="" type="checkbox"/>		Manual Rammer <input type="checkbox"/>		Moist Preparation <input checked="" type="checkbox"/>		Dry Preparation <input type="checkbox"/>	

References / Comments / Deviations: *ND = Not determined *NI = Information was not provided

Jennifer Olsen
Technician Name

Signature
NICET/117926
Certification Type/No.4/23/2012
DateKyle Baucom
Technical Responsibility

Signature
Project Engineer
Position4/23/12
Date

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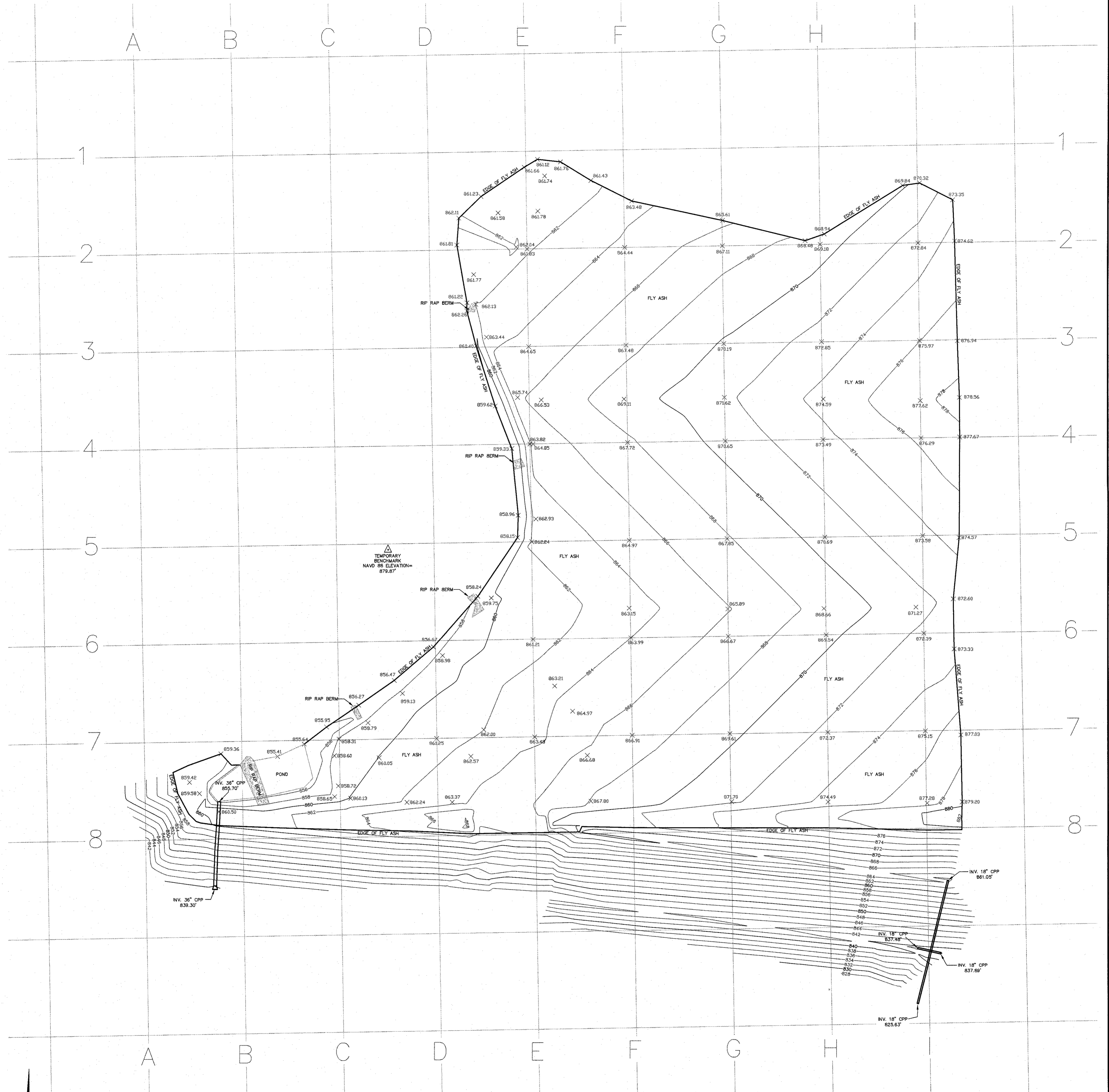
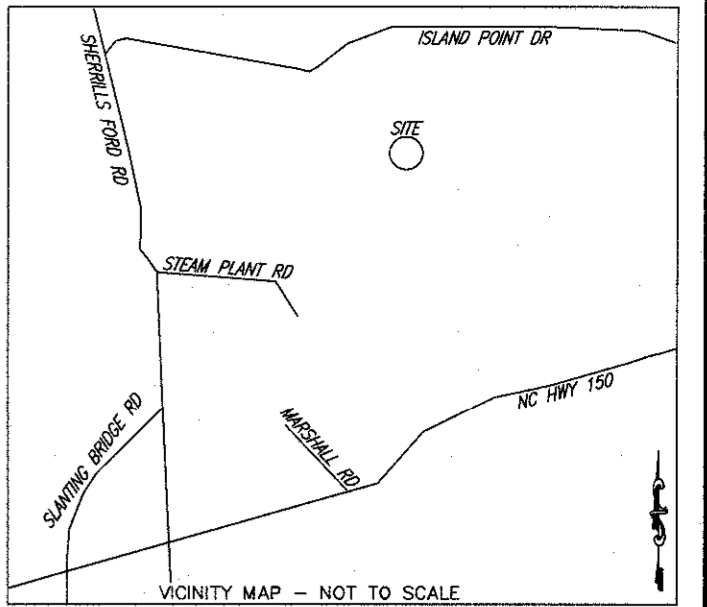
Final Subgrade As-Built Drawing



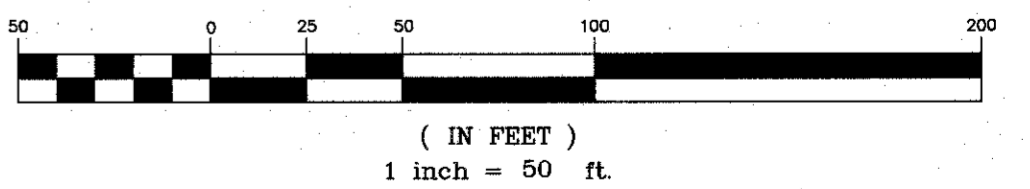
I, DAVID K. BRUBAKER, CERTIFY THAT THIS PROJECT WAS COMPLETED UNDER MY DIRECT AND RESPONSIBLE CHARGE FROM AN ACTUAL GROUND SURVEY MADE UNDER MY SUPERVISION; THAT THE HORIZONTAL AND VERTICAL ACCURACIES MEET OR EXCEED THE NATIONAL MAP ACCURACY STANDARDS; THAT THE DATA WAS OBTAINED BETWEEN JULY 28 AND OCTOBER 11, 2013; THAT THE SURVEY WAS COMPLETED ON OCTOBER 16, 2013; AND THAT ALL ELEVATIONS ARE BASED ON NAVD83.

DAVID K. BRUBAKER, P.L.S. # 2968

DATE
10/22/2013



GRAPHIC SCALE



LEGEND
CPP = CORRUGATED PLASTIC PIPE
INV. = INVERT
X 866.50 = SPOT ELEVATION

GENERAL NOTES:

- ALL DIMENSIONS SHOWN ARE IN US SURVEY FEET AND ARE HORIZONTAL GROUND DISTANCES UNLESS OTHERWISE INDICATED. AREA BY COORDINATE METHOD.
- PROPERTY SUBJECT TO ALL EASEMENTS AND RESTRICTIONS OF RECORD.
- ELEVATIONS ARE BASED ON NAVD83.
- NO FIELD WORK OR RESEARCH WAS PERFORMED TO DETERMINE OR VERIFY ANY BOUNDARY LINES.
- THIS SURVEY IS FOR TOPOGRAPHIC PURPOSES AND IS NOT INTENDED TO BE A BOUNDARY SURVEY OF THE ENTIRE TRACT.
- THIS SURVEY IS OF AN EXISTING PARCEL OF LAND.

TOPOGRAPHIC SURVEY - PRE COVER
OF
CELLS 3 & 4
MARSHALL STEAM STATION
MOUNTAIN CREEK TOWNSHIP, CATAWBA COUNTY, N.C.

PREPARED FOR: S&ME, INC.
9751 SOUTHERN PINE BOULEVARD
CHARLOTTE, NC 28273
PHONE: 704.523.4726 FAX: 704.525.3953

OWNER: DUKE ENERGY CAROLINAS, LLC
PO BOX 1007
CHARLOTTE, NC 28201



128 Talbert Road Suite A • Mooresville, NC 28117 • 704.662.0100
www.wspgroup.com/us

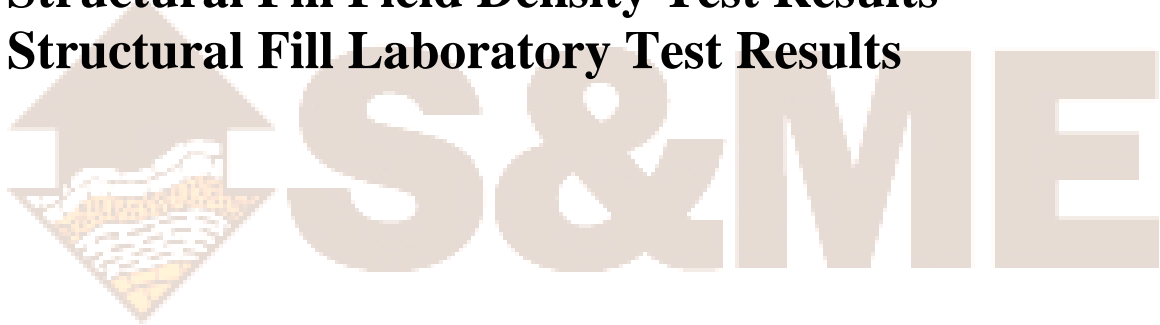
NC LICENSE NO. F-0891

Parcel ID	Drawn By	Date of Survey	Field Book	Job Number
Portion of 461803426350	DE	SEPTEMBER 9, 2013	NA	13-70019.000
Sheet Number	Checked By	Date	Scale	File Name
1 OF 1	DKB	OCTOBER 16, 2013	1" = 50'	CELLS 3 & 4 PRE COVER.DWG

APPENDIX I – EARTHWORKS

Section 2 – Structural Fill Soil Cover

Structural Fill Field Density Test Results
Structural Fill Laboratory Test Results



Structural Fill Field Density Test Results





Summary of Density Test Results

Page No. 1

Report Date: September 26, 2013

Project No.: 1356-11-032SF

Project Name: Marshall Ind.LF #1-Cells3-4Con

Client: Duke Energy, Post Office Box 37929, 8320 Highway 150 East, Terrell, North Carolina 28682

Test		In-Place Density Test			Check Plug Data		Reference Standard				Compaction		Location	Elevation or Stone Depth
No.	Date	Type	Dry Density	Moisture Content	Dry Density	Moisture Content	Type	Ref. Curve	MDD	Optimum Moisture Content	Percent Specified	Percent In-Place		
1	08/23/13	D 2937	91.1	26.6	93.2	22.1	698CP	TP-9	94.2	25.0	95	97	D2	
2	08/23/13	D 2937	92.0	26.3	93.2	22.1	698CP	TP-9	94.2	25.0	95	98	D2	
3	08/23/13	D 2937	97.2	23.4	94.9	22.5	698CP	CSL2	95.8	23.7	95	100+	D1	
4	08/23/13	D 2937	97.5	24.4	94.9	22.5	698CP	CSL2	95.8	23.7	95	100+	C2	
5	08/23/13	D 2937	95.1	26.2	94.9	22.5	698CP	CSL2	95.8	23.7	95	99	C2	
6	08/23/13	D 2937	93.5	23.5	93.2	22.1	698CP	TP-9	94.2	25.0	95	99	C1	
7	08/30/13	D 2937	94.9	22.9	95.1	20.1	698CP	CSL2	97.0	22.5	95	98	D1	
8	08/30/13	D 2937	90.4	23.9	93.3	22.0	698CP	TP-4	94.7	24.4	95	95	D2	
9	08/30/13	D 2937	93.1	21.3	95.1	20.1	698CP	CSL2	97.0	22.5	95	96	D3	
10	08/30/13	D 2937	93.6	22.1	95.1	20.1	698CP	CSL2	97.0	22.5	95	96	C1	
11	08/30/13	D 2937	93.5	20.7	95.1	20.1	698CP	CSL2	97.0	22.5	95	96	C3	
12	08/30/13	D 2937	98.0	20.3	95.1	20.1	698CP	CSL2	97.0	22.5	95	100+	C2	
13	08/30/13	D 2937	95.0	22.2	95.1	20.1	698CP	CSL2	97.0	22.5	95	98	B1	
14	08/23/13	D 2937	94.5	22.3	95.1	20.1	698CP	CSL2	97.0	22.5	95	97	B2	
15	08/30/13	D 2937	91.8	21.0	95.1	20.1	698CP	CSL2	97.0	22.5	95	95	B3	
16	09/03/13	D 2937	92.6	26.2	92.2	22.6	698CP	TP-8	93.0	26.4	95	100	D3	
17	09/03/13	D 2937	90.6	26.5	92.2	22.6	698CP	TP-8	93.0	26.4	95	97	D2	
18	09/03/13	D 2937	93.5	26.5	92.2	22.6	698CP	TP-8	93.0	26.4	95	100+	D1	
19	09/03/13	D 2937	95.5	23.4	92.2	22.6	698CP	CSL2	95.8	23.7	95	100	C1	

* = Failed Specified Compaction, ** = Failed Specified Moisture Content

All Test Locations and Elevations are Approximate

Notes:

References: ASTM D 2937: Density of Soil In Place by the Drive Cylinder Method, 698CP: MDD determined by check plug in accordance with S&ME procedure WI-TP-698-CP-REV2.

Distribution: Dean Snyder/Duke Energy

Kyle Baucom/S&ME, Inc.

Name (Technical Responsibility)


Signature

Project Engineer

Position

Project Name: Marshall Ind.LF #1-Cells3-4Con

Client: Duke Energy, Post Office Box 37929, 8320 Highway 150 East, Terrell, North Carolina 28682

[illegible]

* = Failed Specified Compaction, ** = Failed Specified Moisture Content

All Test Locations and Elevations are Approximate


Notes:

References: ASTM D 2937: Density of Soil In Place by the Drive Cylinder Method, 698CP: MDD determined by check plug in accordance with S&ME procedure WI-TP-698-CP-REV2.

Distribution: Dean Snyder/Duke Energy

Kyle Baucom/S&ME, Inc.

Name (Technical Responsibility)

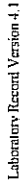

Signature

Project Engineer

Position

Structural Fill Laboratory Test Results





Project #:	1356-11-032 Phase 0			Test Date(s):	5/20-24/12
Project Name:	Marshall Industrial Landfill No. 1 - Cells 3 & 4			Report Date:	5/24/12
Client Name:	Duke Energy			Sample Date:	5/7/2012
Client Address:	526 South Church Street, Charlotte, NC 28202			Panel ID:	B
Boring #:	N/A	Sample #:	TP-1	Depth:	0-6'
Location:	Grid A3	Offset:	Sample Description: Orange Brown Fine Sandy Silty Clay (Mht)		
Liquid Limit:	62	Sp. Grav. (Assumed):	2.700	Sample Type:	Remolded
Plastic Limit:	38	Plastic Index:	24	Percent Passing #200:	69.0%
				Maximum Particle Size:	#4

[illegible]

References:

ASTM D 5084: Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter

ASTM D 2216: Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass

Cumulative Time (sec.)	2.6E-06	2.5E-06	2.6E-06	2.4E-06	2.4E-06	2.3E-06
0						
~50						
~100						
~150						
~200						
~250						
~300						
~350						
~400						
~450						
~500						
~550						
~600						
~650						
~700						
~750						
~800						
~850						
~900						
~950						
~1000						

Technician:	<u>Karen Warner</u>	Signature		Position:	<u>Project Engineer</u>
Technical Responsibility:	<u>Kyle Baucom</u>	Signature			

Moisture - Density Report



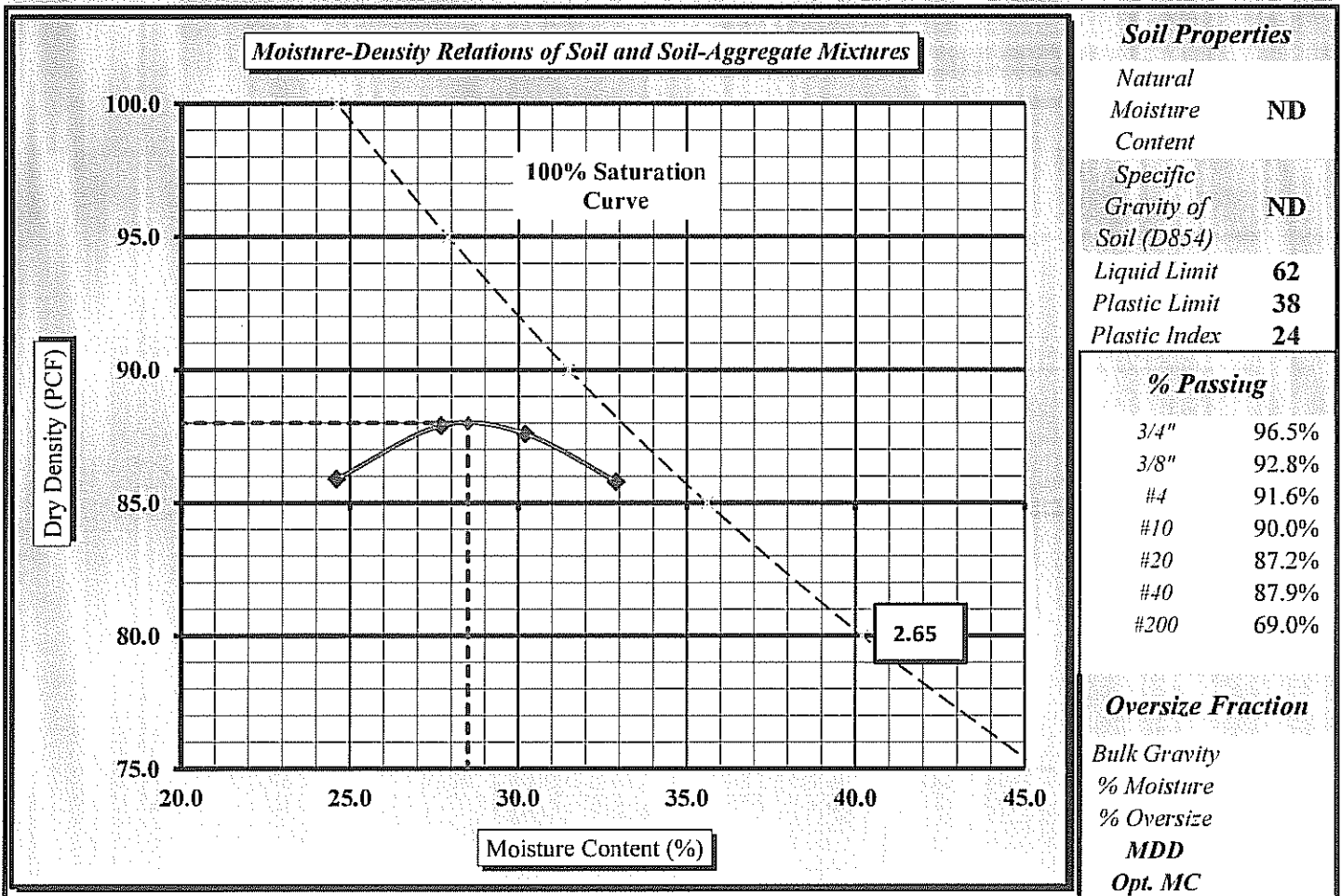
Quality Assurance

S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273

S&ME Project #:	1356-11-032	Phase 03	Report Date:	5/17/12	
Project Name:	Marshall Industrial Landfill No. 1 - Cells 3 & 4		Test Date(s):	5/15-17/12	
Client Name:	Duke Energy				
Client Address:	526 South Church Street, Charlotte, NC 28202				
Boring #:	NI	Sample #:	TP-1	Sample Date:	5/7/2012
Location:	Grid A3	Offset:	NI	Depth:	0-6'
Sample Description:	Orange Brown Fine Sandy Silty Clay (MH)				

Maximum Dry Density 88.0 PCF. Optimum Moisture Content 28.5%

ASTM D 698 -- Method A



Moisture-Density Curve Displayed: Fine Fraction ☒ Corrected for Oversize Fraction (ASTM D 4718) ☐
 Sieve Size used to separate the Oversize Fraction: #4 Sieve ☒ 3/8 inch Sieve ☐ 3/4 inch Sieve ☐
 Mechanical Rammer ☒ Manual Rammer ☐ Moist Preparation ☐ Dry Preparation ☒

References / Comments / Deviations: *ND = Not determined *NI = Information was not provided

Jennifer L. Olson

ASTM D 2216: Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass

ASTM D 698: Laboratory Compaction Characteristics of Soil Using Standard Effort

Kyle Baucom

Technical Responsibility

Kyle Baucom
Signature

Project Engineer
Position

5/30/12
Date

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Moisture - Density Relationship



ASTM D558, D698, D1557, AASHTO T99, T180

Quality Assurance

S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273

Project #:	1356-11-032	Phase 03	Report Date:	5/17/12
Project Name:	Marshall Industrial Landfill No. 1 - Cells 3 & 4		Test Date(s)	5/15-17/12
Client Name:	Duke Energy			
Client Address:	526 South Church Street, Charlotte, NC 28202			
Boring #:	NI	Sample #:	TP-1	Sample Date:
Location:	Grid A3	Offset:	NI	Depth:
Sample Description:	Orange Brown Fine Sandy Silty Clay (MH)			
Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #
Balance (0.1 g)	22182	6/8/2011	Compaction Mold	20231
Balance	22182	6/8/2011	Compaction Hammer	20222
Straightedge	20124	1/17/2012	Oven	10844
Sieve #4	10939	4/3/2012		

Water Content	Water Content requires GP 2 Balance (0.1 gram Readability).					Check:	
ASTM D2216 <input checked="" type="checkbox"/>	AASHTO T265 <input type="checkbox"/>	ASTM D4959 <input type="checkbox"/>			ASTM D4643 <input type="checkbox"/>		
Water Added:	180	240	120	300			
Tare #:	691	EL	JC	13			
A. Tare Weight	A.	156.5	165.8	164.1	156.8		
B. Wet Wt + Tare Wt	B.	1155.5	1134.4	1101.8	1083.2		
C. Dry Wt. + Tare Wt.	C.	938.6	909.9	916.5	853.8		
D. Water Weight	B-C	216.9	224.5	185.3	229.4		
E. Dry Weight	C-A	782.1	744.1	752.4	697.0		
F. Moisture Content	100*D/E	27.7%	30.2%	24.6%	32.9%		
Compaction Data	Requires a GP 5 Balance for ASTM (1 gram or .0022 Lb. readability).					Check:	
ASTM D558 <input type="checkbox"/>	ASTM D 698 <input checked="" type="checkbox"/>	ASTM D1557 <input type="checkbox"/>	AASHTO T99 <input type="checkbox"/>	AASHTO T180 <input type="checkbox"/>			
Method A <input checked="" type="checkbox"/>	Method B <input type="checkbox"/>	Method C <input type="checkbox"/>	Method D (ASTM 1978) <input type="checkbox"/>	AASHTO Method D <input type="checkbox"/>			
G. Wt of Soil + Mold	G.	5933	5962	5855	5961		
H. Wt. of Mold	H.	4242	4242	4242	4242		
I. Wt. of Soil (g. or lbs.)	G-H	1691	1720	1613	1719		
J. Wt of Soil (Lbs.)	1/453.6 or I	3.728	3.792	3.556	3.790		
K. Mold Volume Factor	K.	30.09	30.09	30.09	30.09		
L. Wet Density (PCF)	J*K	112.2	114.1	107.0	114.0		
M. Dry Density (PCF)	L/(1+F)	87.9	87.6	85.9	85.8		
Sieve Size used to separate the Oversize Fraction:		#4 Sieve <input checked="" type="checkbox"/>		3/8 inch Sieve <input type="checkbox"/>		3/4 inch Sieve <input type="checkbox"/>	
Mechanical Rammer <input checked="" type="checkbox"/>		Manual Rammer <input type="checkbox"/>		Moist Preparation <input type="checkbox"/>		Dry Preparation <input checked="" type="checkbox"/>	

References / Comments / Deviations: *ND = Not determined *NI = Information was not provided

Jennifer Olsen

Technician Name

Signature

NICET/117926

Certification Type/No.

5/17/2012

Date

Kyle Baucom

Technical Responsibility

Signature

Position

5/30/12

Date

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Particle Size Analysis of Soils



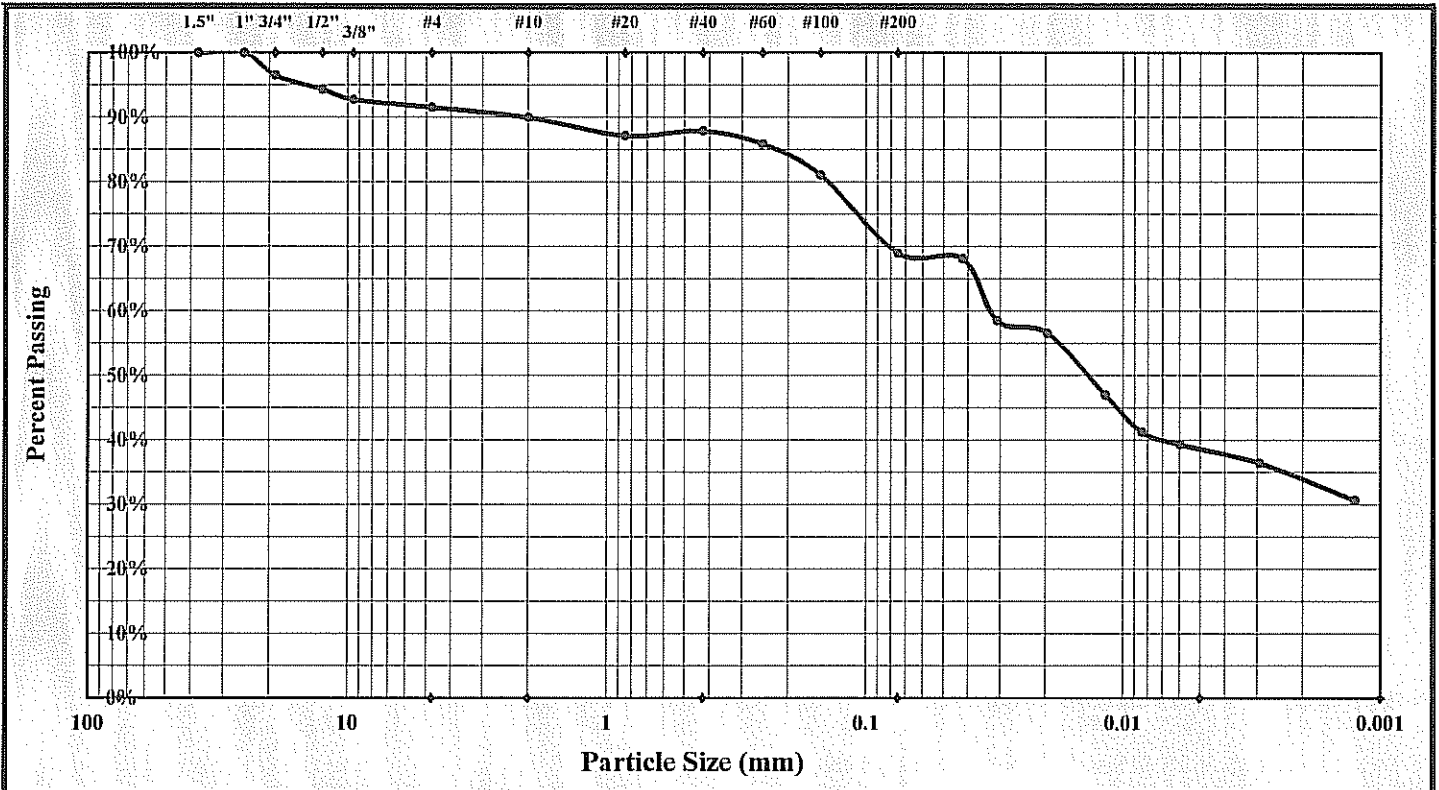
ASTM D422

Quality Assurance

S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273

S&ME Project #:	1356-11-032 Phase 03	Report Date:	5/24/12
Project Name:	Marshall Industrial Landfill No. 1- Cells 3 & 4	Test Date(s):	5/14/-24/12
Client Name:	Duke Energy		
Address:	526 South Church Street, Charlotte, NC		
Boring #:	NA	Sample #:	TP-1
Location:	Grid A3	Offset:	NI
		Sample Date:	5/7/12
		Elevation:	0-6'

Sample Description: Orange Brown Fine Sandy Silty Clay (MH)



Cobbles	< 300 mm (12\") and > 75 mm (3\")	Fine Sand	< 0.425 mm and > 0.075 mm (#200)
Gravel	< 75 mm and > 4.75 mm (#4)	Silt	< 0.075 and > 0.005 mm
Coarse Sand	< 4.75 mm and > 2.00 mm (#10)	Clay	< 0.005 mm
Medium Sand	< 2.00 mm and > 0.425 mm (#40)	Colloids	< 0.001 mm

Maximum Particle Size:	3/4"	Gravel:	8.4%	Silt	30.5%
Silt & Clay (% Passing #200):	69.0%	Total Sand:	22.6%	Clay	38.5%
Moisture Content				Colloids	
Liquid Limit	62	Plastic Limit	38	Plastic Index	24
Coarse Sand:	1.6%	Medium Sand:	2.1%	Fine Sand:	18.9%

Description of Sand and Gravel: Rounded ☐ Angular ☐ Hard & Durable ☐ Soft ☐ Weathered & Friable ☐

Mechanical Stirring Apparatus A Dispersion Period: 1 min. Dispersing Agent: Sodium Hexametaphosphate: 40 g./ Liter

References / Comments / Deviations: ASTM D 4318, D 2487 NI = Information not provided.

Technician Name: Date:

Kyle Baucom
Technical Responsibility

[Signature]
Signature

Project Engineer
Position

5/30/12
Date

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Particle Size Analysis of Soils



ASTM D 422

S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273

Project #: 1356-11-032 Phase 03

Report Date: 5/24/12

Project Name: Marshall Industrial Landfill No. 1- Cells 3 & 4 Test Date(s): 5/14/24/12

Client Name:	Duke Energy	Address:	526 South Church Street, Charlotte, NC
Boring #:	NA	Sample #:	TP-1
Location:	Grid A3	Offset:	NI
Sample Description:	Orange Brown Fine Sandy Silty Clay (MH)	Sample Date:	5/7/12
Pan #:		Elevation:	0-6'
Beaker #:		Apparent Relative Density (Assumed)	2.700
Hydrometer Jar #:			
Pan Tare Weight (grams):		Moisture Content	
Total Sample Air Dried Wt. + tare wt. (grams):		Tare #	KK
Weight of Total Sample Air Dried:		Tare Wt.	ND
Weight of Air Dried Hydrometer Sample (g):		Wet Wt. + A	26.21
Total Sample Oven Dried:		Dry Wt. + A	25.49
Hydrometer Sample Oven Dried (W):		Water Wt. (B-C)	0.72
% Passing #10:		Dry Wt. (C-A)	9.41
Correction Factor a (Table 1):		% Moisture (100 x D/E)	7.65%

Description of Sand & Gravel Particles ☒ Rounded ☐ Angular ☐ Hard & Durable ☐ Soft ☐ Weathered & Friable ☐Stirring Apparatus: A ☒ B ☐ Dispersion Time: 1 min. Sodium Hexametaphosphate: 40 g./ Liter

Balance: ID No. 3222

Cal. Date: 6/23/2011

Hydrometer: ID No. 3901

Cal. Date: 3/25/2012

Control Cylinder ☒ Composite Correction ☐

Type: 151H

152H

Time		Temp. (0.5 °C)	Hydrometer		Corrections		Hydrometer R	Percent Passing		Effective Depth L	Table 3 K	Diameter D = $K \times (L/T)^{1/2}$
T (Min.)	Reading		Control Cylinder	Composite Correction	P(#10) = (R x a / W) x 100	P (total) = P x % Passing #10						
1	23.0	41.0	5.5		35.50	75.7%	68.1%	10.5	0.01297	0.04199		
2	23.0	36.0	5.5		30.50	65.0%	58.5%	11.3	0.01297	0.03083		
5	23.0	35.0	5.5		29.50	62.9%	56.6%	11.5	0.01297	0.01964		
15	23.5	30.0	5.5		24.50	52.2%	47.0%	12.3	0.01290	0.01167		
30	23.5	26.5	5.0		21.50	45.8%	41.2%	12.8	0.01290	0.00841		
60	23.5	25.5	5.0		20.50	43.7%	39.3%	12.9	0.01290	0.00599		
250	24.0	23.0	4.0		19.00	40.5%	36.4%	13.2	0.01282	0.00294		
1440	23.5	21.0	5.0		16.00	34.1%	30.7%	13.7	0.01290	0.00126		

References / Comments / Deviations ASTM D 422, D 2487, D 4318

NI = Information not provided.

Karen Warner
Technician NameNICET 117900
Certification #Kyle Baucom
Technical ResponsibilityProject Engineer
Position5/30/12
Date

S&ME, Inc. - Corporate

3201 Spring Forest Road
Raleigh, N.C. 27616

1356-11-032 Phase 03 TP-1 (0-6') Hydro.xls

Page 1 of 1

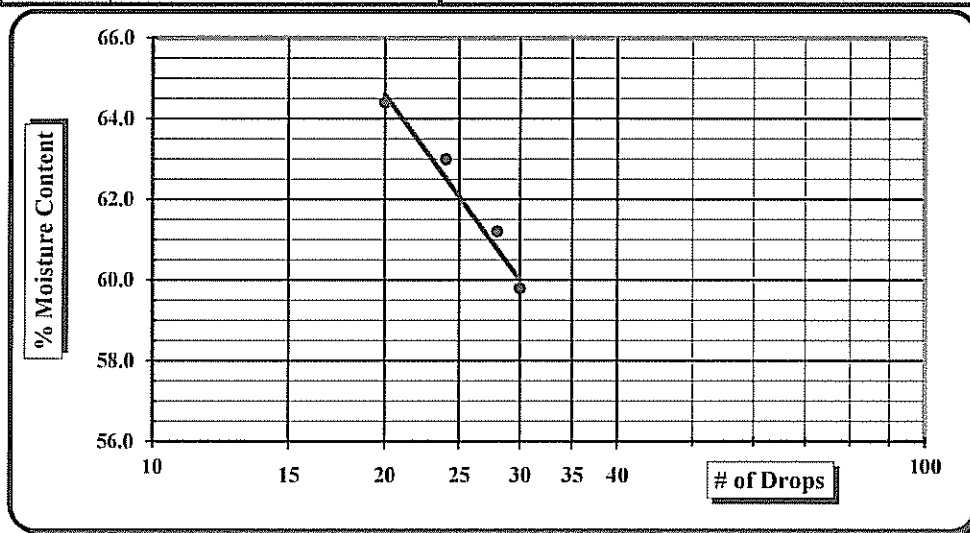
Liquid Limit, Plastic Limit, and Plastic Index



S&ME, Inc. ~9751 Southern Pine Boulevard, Charlotte, NC 28273

Project #:	1356-11-032	Phase 03	Report Date:	5/30/12
Project Name:	Marshall Industrial Landfill No. 1 - Cells 3 & 4		Test Date(s)	5/14-30/12
Client Name:	Duke Energy			
Client Address:	526 South Church Street, Charlotte, NC 28202			
Boring #:	NI	Sample #:	TP-1	Sample Date:
Location:	Grid A3	Offset:	NI	Elevation:
Sample Description:	Orange Brown Fine Sandy Silty Clay (MH)			
Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #
Balance (0.01 g)	3222	6/23/2011	Grooving tool	22165
LL Apparatus	20230	6/23/2011	Grooving tool	
Oven	10844	5/9/2012	Grooving tool	

Pan #	Tare #:	Liquid Limit					Plastic Limit		
		56	LL	25	12		17	57	
A	Tare Weight	15.68	16.94	14.37	14.19		14.00	13.90	
B	Wet Soil Weight + A	31.20	32.96	29.24	26.90		20.43	20.10	
C	Dry Soil Weight + A	25.39	26.88	23.49	21.92		18.68	18.41	
D	Water Weight (B-C)	5.81	6.08	5.75	4.98		1.75	1.69	
E	Dry Soil Weight (C-A)	9.71	9.94	9.12	7.73		4.68	4.51	
F	% Moisture (D/E)*100	59.8%	61.2%	63.0%	64.4%		37.4%	37.5%	
N	# OF DROPS	30	28	24	20		Moisture Contents determined by ASTM D 2216		
LL	LL = F * FACTOR								
Ave.	Average						37.5%		



One Point Liquid Limit			
N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic ☐

Liquid Limit 62

Plastic Limit 38

Plastic Index 24

Group Symbol MH

Multipoint Method ☒One-point Method ☐Wet Preparation ☐ Dry Preparation ☒ Air Dried ☒ Estimate the % Retained on the #40 Sieve:

Notes / Deviations / References: NI = Information not provided.

ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils

Jennifer Olsen

Technician Name

Jennifer Olsen 5/30/2012

Date

Kyle Baucom

Technical Responsibility

5/30/12

Date

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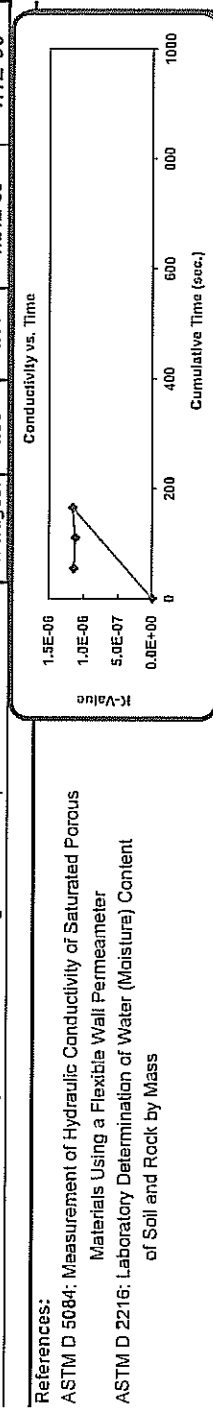


Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter (Method "F")

Laboratory Record Version 4.1

Project #: 1356-11-032 Phase 03
Project Name: Marshall Industrial Landfill No.1 - Cells 3 & 4
Client Name: Duke Energy
Client Address: 526 South Church Street, Charlotte, NC 28202
Boring #: NA Sample #: TP-4 Depth: 0-4'
Location: Grid C2 Offset:
Liquid Limit: 57 Sp. Grav. (Assumed): 2.700 Sample Type: Remolded
Plastic Limit: 26 Plastic Index: 31 Percent Passing #200: 72.2% Maximum Particle Size: #4
Test Date(s): 5/20-24/12
Report Date: 5/24/12
Sample Date: 5/7/2012
Panel ID: 7
Perm Cell ID:

Initial Sample Conditions										Final Sample Conditions									
Length (cm):	7.689	Wet Density (PCF):	111.6	Length (cm):	7.630	Wet Density (PCF):	120.1												
Diameter (cm):	7.304	Dry Density (PCF):	89.1	Diameter (cm):	7.25	Dry Density (PCF):	91.0												
Area (cm ²):	41.90	Percent Saturation:	76.4	Area (cm ²):	41.34	Percent Saturation:	100.0												
Volume (cm ³):	322.20			Volume (cm ³):	315.74	B-Parameter:	0.95												
Wet weight (grams)	576.0	Void Ratio:	0.091	Wet weight (grams)	607.3	Void Ratio:	0.853												
Dry Weight (grams)	460.1	Porosity:	0.471	Dry Weight (grams)	460.1	Porosity:	0.460												
Percent Moisture:	25.2			Percent Moisture:	32.0														
Test Parameters:																			
Hg Equilibrium Level																			
Effective Consolidation Stress (psi):																			
Cell Pressure (psi):																			
Back Pressure (psi):																			
Permeant Liquid Used:																			
Deaired Water																			
a _{in} (cm ²):																			
a _{out} (cm ²):																			
80.0																			
K-Value (cm/sec)																			
Uncorrected K-Value																			
Corrected K-Value																			
1.14E-06																			
1.12E-06																			
1.16E-06																			



Moisture - Density Report



Quality Assurance

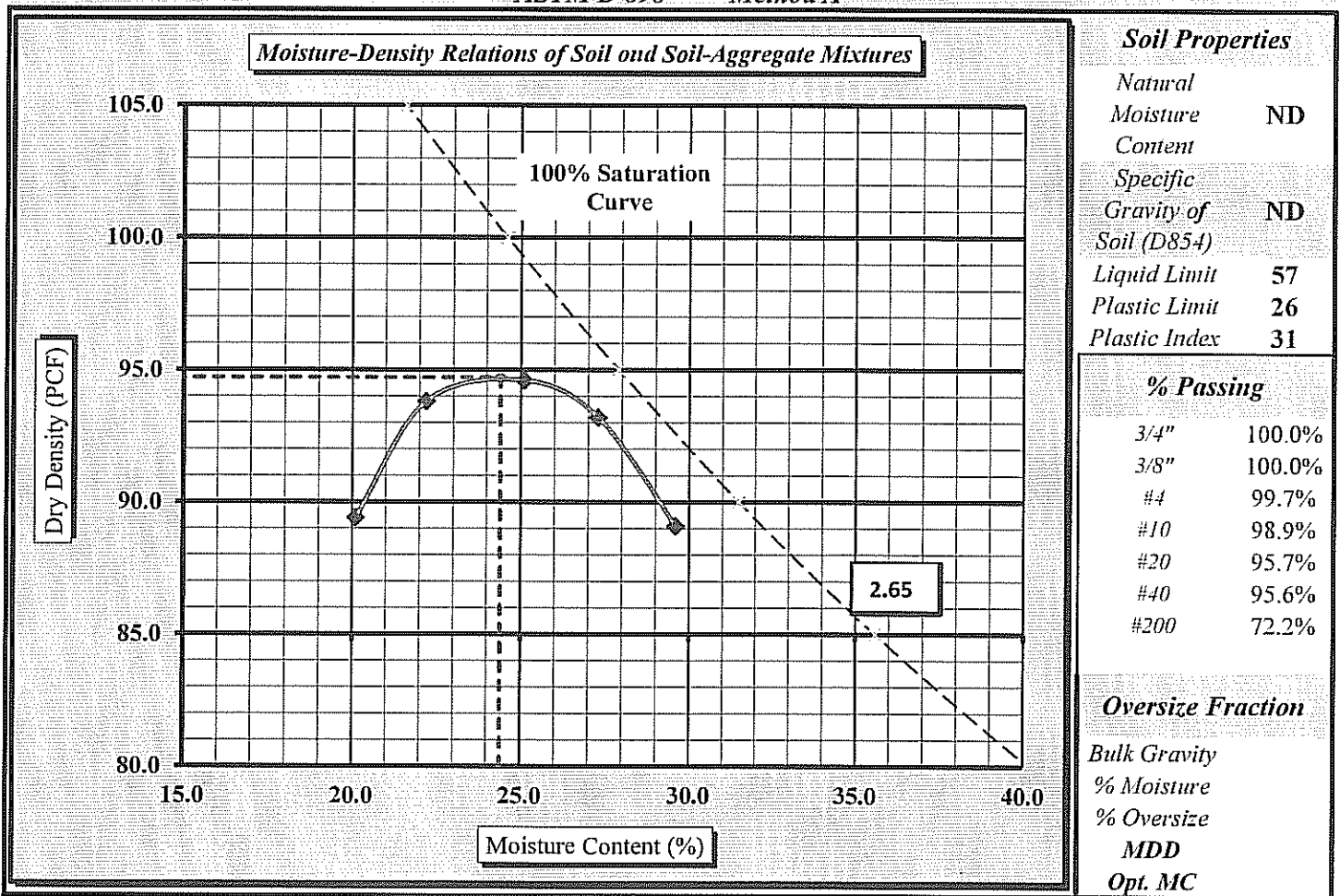
S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273

S&ME Project #:	1356-11-032	Phase 03	Report Date:	5/17/12	
Project Name:	Marshall Industrial Landfill No. 1 - Cells 3 & 4		Test Date(s):	5/15-17/12	
Client Name:	Duke Energy				
Client Address:	526 South Church Street, Charlotte, NC 28202				
Boring #:	NI	Sample #:	TP-4	Sample Date:	5/7/2012
Location:	Grid C2	Offset:	NI	Depth:	0-4'
Sample Description:	Brown Orange Silty Clay (CH) with Fine Sand				

Maximum Dry Density 94.7 PCF.

Optimum Moisture Content 24.4%

ASTM D 698 -- Method A



Moisture-Density Curve Displayed: Fine Fraction ☒ Corrected for Oversize Fraction (ASTM D 4718) ☐
 Sieve Size used to separate the Oversize Fraction: #4 Sieve ☒ 3/8 inch Sieve ☐ 3/4 inch Sieve ☐
 Mechanical Rammer ☒ Manual Rammer ☐ Moist Preparation ☐ Dry Preparation ☒

References / Comments / Deviations: *ND = Not determined *NI = Information was not provided

Jennifer J. Olson

ASTM D 2216: Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass

ASTM D 698: Laboratory Compaction Characteristics of Soil Using Standard Effort

Kyle Baucom
Technical Responsibility

[Signature]
Signature

Project Engineer
Position

5/16/12
Date

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Moisture - Density Relationship



ASTM D558, D698, D1557, AASHTO T99, T180

Quality Assurance

S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273

Project #:	1356-11-032	Phase 03	Report Date:	5/17/12
Project Name:	Marshall Industrial Landfill No. 1 - Cells 3 & 4		Test Date(s)	5/15-17/12
Client Name:	Duke Energy			
Client Address:	526 South Church Street, Charlotte, NC 28202			
Boring #:	NI	Sample #:	TP-4	Sample Date: 5/7/2012
Location:	Grid C2	Offset:	NI	Depth: 0-4'
Sample Description:	Brown Orange Silty Clay (CH) with Fine Sand			
Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID # Cal Date:
Balance (0.1 g)	22182	6/8/2011	Compaction Mold	20231 1/6/2012
Balance	22182	6/8/2011	Compaction Hammer	20222 6/6/2011
Straightedge	20124	1/17/2012	Oven	10844 5/9/2012
Sieve #4	10939	4/3/2012		

Water Content		Water Content requires GP 2 Balance (0.1 gram Readability).				Check:	
ASTM D2216 <input checked="" type="checkbox"/>		AASHTO T265 <input type="checkbox"/>		ASTM D4959 <input type="checkbox"/>		ASTM D4643 <input type="checkbox"/>	
Water Added:		300	360	420	240	480	
Tare #:		DLB	695	GH	JLG	99	
A. Tare Weight	A.	159.7	161.3	164.2	162.9	158.1	
B. Wet Wt + Tare Wt	B.	1150.3	1180.6	1127.4	1054.1	1303.2	
C. Dry Wt. + Tare Wt.	C.	970.6	975.8	920.9	905.2	1041.9	
D. Water Weight	B-C	179.7	204.8	206.5	148.9	261.3	
E. Dry Weight	C-A	810.9	814.5	756.7	742.3	883.8	
F. Moisture Content	100*D/E	22.2%	25.1%	27.3%	20.1%	29.6%	
Compaction Data		Requires a GP 5 Balance for ASTM (1 gram or .0022 Lb. readability).				Check:	
ASTM D558 <input type="checkbox"/>		ASTM D 698 <input checked="" type="checkbox"/>		ASTM D1557 <input type="checkbox"/>		AASHTO T99 <input type="checkbox"/>	
Method A <input checked="" type="checkbox"/>		Method B <input type="checkbox"/>		Method C <input type="checkbox"/>		Method D (ASTM 1978) <input type="checkbox"/>	
						AASHTO T180 <input type="checkbox"/>	
						AASHTO Method D <input type="checkbox"/>	
G. Wt of Soil + Mold	G.	5969	6025	6031	5861	5984	
H. Wt. of Mold	H.	4242	4242	4242	4242	4242	
I. Wt. of Soil (g. or lbs.)	G-H	1727	1783	1789	1619	1742	
J. Wt of Soil (Lbs.)	I/453.6 or I	3.807	3.931	3.944	3.569	3.840	
K. Mold Volume Factor	K.	30.09	30.09	30.09	30.09	30.09	
L. Wet Density (PCF)	J*K	114.6	118.3	118.7	107.4	115.5	
M. Dry Density (PCF)	L/(1+F)	93.8	94.6	93.2	89.4	89.1	
Sieve Size used to separate the Oversize Fraction:		#4 Sieve <input checked="" type="checkbox"/>		3/8 inch Sieve <input type="checkbox"/>		3/4 inch Sieve <input type="checkbox"/>	
Mechanical Rammer <input checked="" type="checkbox"/>		Manual Rammer <input type="checkbox"/>		Moist Preparation <input type="checkbox"/>		Dry Preparation <input checked="" type="checkbox"/>	

References / Comments / Deviations: *ND = Not determined *NI = Information was not provided

Jennifer Olsen
Technician Name

Signature
NICET/117926
Certification Type/No.5/17/2012
DateKyle Baucom
Technical Responsibility

Signature

Position
5/30/12
Date

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Particle Size Analysis of Soils

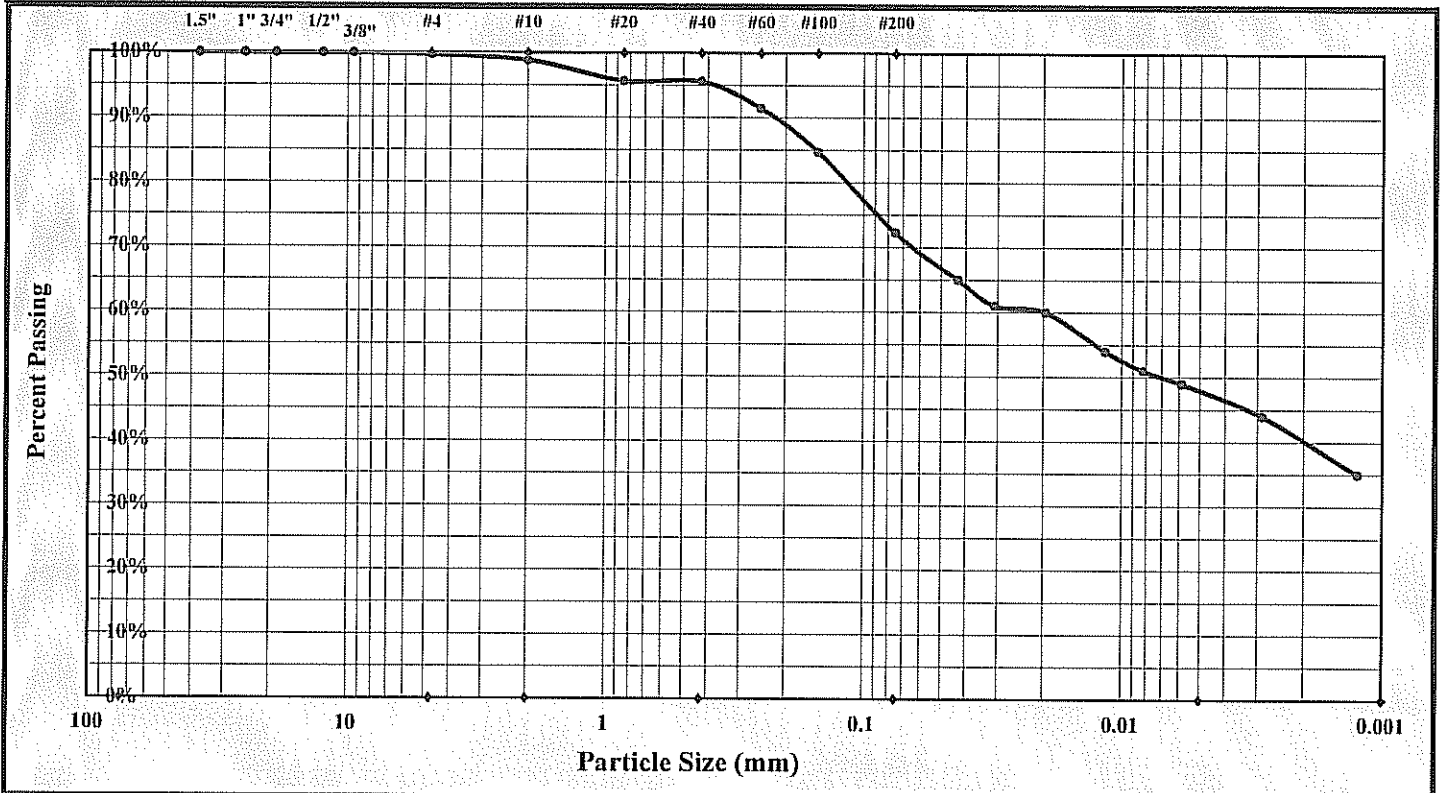


ASTM D422

Quality Assurance

S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273

S&ME Project #:	1356-11-032 Phase 03	Report Date:	5/24/12
Project Name:	Marshall Industrial Landfill No. 1- Cells 3 & 4	Test Date(s):	5/14/-24/12
Client Name:	Duke Energy		
Address:	526 South Church Street, Charlotte, NC		
Boring #:	NA	Sample #:	TP-4
Location:	Grid C2	Offset:	NI
		Elevation:	0-4'
Sample Description:	Brown Orange Silty Clay (CH) with Fine Sand		



Particle Size Analysis of Soils

ASTM D 422



S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273

Project #: 1356-11-032 Phase 03

Report Date: 5/24/12

Project Name: Marshall Industrial Landfill No. 1 - Cells 3 & 4 Test Date(s): 5/14/24/12

Client Name: Duke Energy Address: 526 South Church Street, Charlotte, NC

Boring #: NA Sample #: TP-4 Sample Date: 5/7/12

Location: Grid C2 Offset: NI Elevation: 0-4'

Sample Description: Brown Orange Silty Clay (CH) with Fine Sand

Pan #	Beaker #	Apparent Relative Density (Assumed)	2.700	Sieve	Retained Wt.	Percent Passing
Hydrometer Jar #:				3.0"	0.0	100.0%
Pan Tare Weight (grams):				1.5"	0.0	100.0%
Total Sample Air Dried Wt. + tare wt. (grams):				1.0"	0.0	100.0%
Weight of Total Sample Air Dried:				3/4"	0.0	100.0%
Weight of Air Dried Hydrometer Sample (g):				1/2"	0.0	100.0%
Total Sample Oven Dried:				3/8"	0.0	100.0%
Hydrometer Sample Oven Dried (W):				#4	1.1	99.7%
% Passing #10:				#10	4.4	98.9%
Correction Factor a (Table 1):				#20	1.6	95.7%
Description of Sand & Gravel Particles				#40	1.6	95.6%
Stirring Apparatus: A <input checked="" type="checkbox"/> B <input type="checkbox"/>				#60	3.7	91.4%
Balance: ID No. 3222 Cal. Date: 6/23/2011 Hydrometer: ID No. 3901 Type: 151H <input type="checkbox"/> 152H <input checked="" type="checkbox"/>				#100	7.0	84.7%
Control Cylinder <input checked="" type="checkbox"/> Composite Correction <input type="checkbox"/>				#200	13.2	72.2%

Dispersion Time: 1 min. Sodium Hexametaphosphate: 40 g./Liter

Control Cylinder ☒ Composite Correction ☐

Time	Temp.	Hydrometer Reading	Control Cylinder	Composite Correction	Hydrometer R	Percent Passing	Effective Depth	Table 3	Diameter
T (Min.)	(0.5 °C)					P(-#10) = (R x a / W) x 100	L	K	D = K x (L/T) ^{1/2}
1	23.0	38.0	5.5		32.50	65.7%	11.0	0.01297	0.04296
2	23.0	36.0	5.5		30.50	61.7%	11.3	0.01297	0.03083
5	23.0	35.5	5.5		30.00	60.7%	11.4	0.01297	0.01957
15	23.0	32.5	5.5		27.00	54.6%	11.9	0.01297	0.01154
30	23.0	31.0	5.5		25.50	51.6%	12.1	0.01297	0.00824
60	23.0	30.0	5.5		24.50	49.6%	12.3	0.01297	0.00587
250	24.0	26.0	4.0		22.00	44.5%	12.7	0.01282	0.00289
1440	23.5	22.5	5.0		17.50	35.4%	13.4	0.01290	0.00125

References / Comments / Deviations ASTM D 422, D 2487, D 4318

NI = Information not provided.

Karen Warner
Technician NameNICET 117900
Certification #Kyle Baucom
Technical ResponsibilityProject Engineer
Position5/30/12
Date

Liquid Limit, Plastic Limit, and Plastic Index



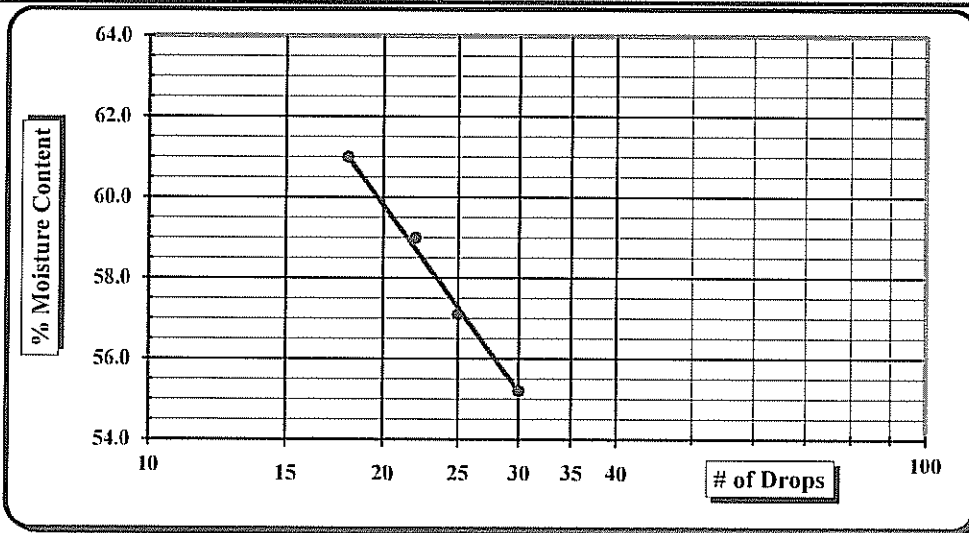
S&ME, Inc. - 9751 Southern Pine Boulevard, Charlotte, NC 28273

Project #: 1356-11-032 **Phase 03** **Report Date:** 5/30/12
Project Name: Marshall Industrial Landfill No. 1 - Cells 3 & 4 **Test Date(s)** 5/14-30/12
Client Name: Duke Energy
Client Address: 526 South Church Street, Charlotte, NC 28202
Boring #: NI **Sample #:** TP-4 **Sample Date:** 5/7/12
Location: Grid C2 **Offset:** NI **Elevation:** 0-4'

Sample Description: Brown Orange Silty Clay (CH) with Fine Sand

Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #	Cal Date:
Balance (0.01 g)	3222	6/23/2011	Grooving tool	22165	12/20/2011
LL Apparatus	20230	6/23/2011	Grooving tool		
Oven	10844	5/9/2012	Grooving tool		

Pan #	Tare #:	Liquid Limit						Plastic Limit		
		WN	9	59	37			P-11	MM	
A	Tare Weight	16.59	13.93	15.81	15.89			12.58	16.58	
B	Wet Soil Weight + A	28.87	26.62	27.56	27.08			18.92	23.09	
C	Dry Soil Weight + A	24.50	22.01	23.20	22.84			17.61	21.72	
D	Water Weight (B-C)	4.37	4.61	4.36	4.24			1.31	1.37	
E	Dry Soil Weight (C-A)	7.91	8.08	7.39	6.95			5.03	5.14	
F	% Moisture (D/E)*100	55.2%	57.1%	59.0%	61.0%			26.0%	26.7%	
N	# OF DROPS	30	25	22	18			Moisture Contents determined by ASTM D 2216		
LL	LL = F * FACTOR									
Ave.	Average							26.4%		



One Point Liquid Limit			
N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic ☐

Liquid Limit 57

Plastic Limit 26

Plastic Index 31

Group Symbol CH

Multipoint Method ☒One-point Method ☐Wet Preparation ☐ Dry Preparation ☒ Air Dried ☒

Estimate the % Retained on the #40 Sieve:

Notes / Deviations / References: NI = Information not provided.

ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils

Jennifer Olsen
Technician NameJennifer Olsen 5/30/2012
DateKyle Baueom
Technical Responsibility5/30/12
Date

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Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter (Method "F")

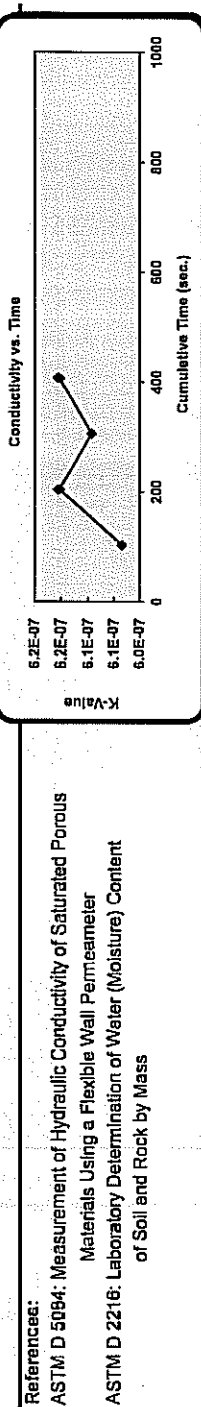
Laboratory Record Version 4.1

Project #: 1358-11-032 Phase 0
Project Name: Marshall Industrial Landfill No. 1 - Cells 3 & 4
Client Name: Duke Energy
Client Address:
Boring #: NA Sample #: TP-6 Depth: 0-2'
Location: Grid E2 Offset:
Liquid Limit: 82 Sp. Grav. (Assumed): 2.700 Sample Type: Remolded
Plastic Limit: 37 Plastic Index: 45 Percent Passing #200: 82.8% Maximum Particle Size: #4

Test Date(s): 5/20-24/12
Report Date: 5/24/12
Sample Date: 5/17/2012
Panel ID: 22219
Perm Cell ID:

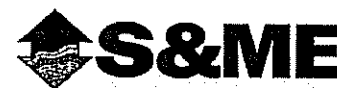
Plastic Limit: 37		Plastic Index: 45			Percent Passing #200: 82.9%			Maximum Particle Size: #4													
Initial Sample Conditions						Final Sample Conditions															
Length (cm):	7.620	Wet Density (PCF):	106.0	Length (cm):	7.620	Wet Density (PCF):	114.7														
Diameter (cm):	7.284	Dry Density (PCF):	79.9	Diameter (cm):	7.28	Dry Density (PCF):	79.9														
Area (cm ²):	41.67	Percent Saturation:	79.8	Area (cm ²):	41.66	Percent Saturation:	100.0														
Volume (cm ³):	317.54			Volume (cm ³):	317.48	B-Parameter:	0.96														
Wet weight (grams):	539.6	Void Ratio:	1.110	Wet weight (grams):	583.4	Void Ratio:	1.110														
Dry Weight (grams):	406.3	Porosity:	0.626	Dry Weight (grams):	406.3	Porosity:	0.626														
Percent Moisture:	32.8			Percent Moisture:	43.6																
Test Parameters:		Effective Consolidation Stress (psi):		2.6		Permeant Liquid Used:		Deaired Water		a _n (cm ⁴)											
Hg Equilibrium Level		1.990		Cell Pressure (psi):		82.6		Back Pressure (psi):		80.0											
Time (24-hr)		Temperature (°C)		Measurements						Initial Gradient		Final Gradient		Uncorrected K-Value		Corrected K-Value					
Start	End	Time (sec)	Initial	Final	Ave.	Factor	Rp1	Ra1	Rp2	Ra2	h1	h2									
8:49	6:51	103	23.5	23.5	23.5	0.9204	4.90	1.98	4.50	1.98	36.7	31.7	4.82	4.16		6.56E-07	6.04E-07				
9:05	9:07	101	23.5	23.5	23.5	0.9204	4.80	1.99	4.50	1.98	36.7	31.7	4.82	4.16		6.69E-07	6.15E-07				
9:08	9:09	102	23.5	23.5	23.5	0.9204	4.80	1.98	4.50	1.98	36.7	31.7	4.82	4.16		6.62E-07	6.09E-07				
9:11	9:12	101	23.5	23.5	23.5	0.9204	4.90	1.98	4.50	1.98	36.7	31.7	4.82	4.16		8.99E-07	6.15E-07				
Notes:		Permeometer P700000 by Tautwain Soil Testing was used for permeation										Averages:		4.82		4.16		5.64E-07		6.1E-07	

Notes: Permeameter P7000000 by Trudewein Soil Testing was used for permeation.



Technician: Karen Warner
Technical Responsibility: Kyle Baucom
Signature:
Position: Project Engineer

Moisture - Density Report



Quality Assurance

S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273

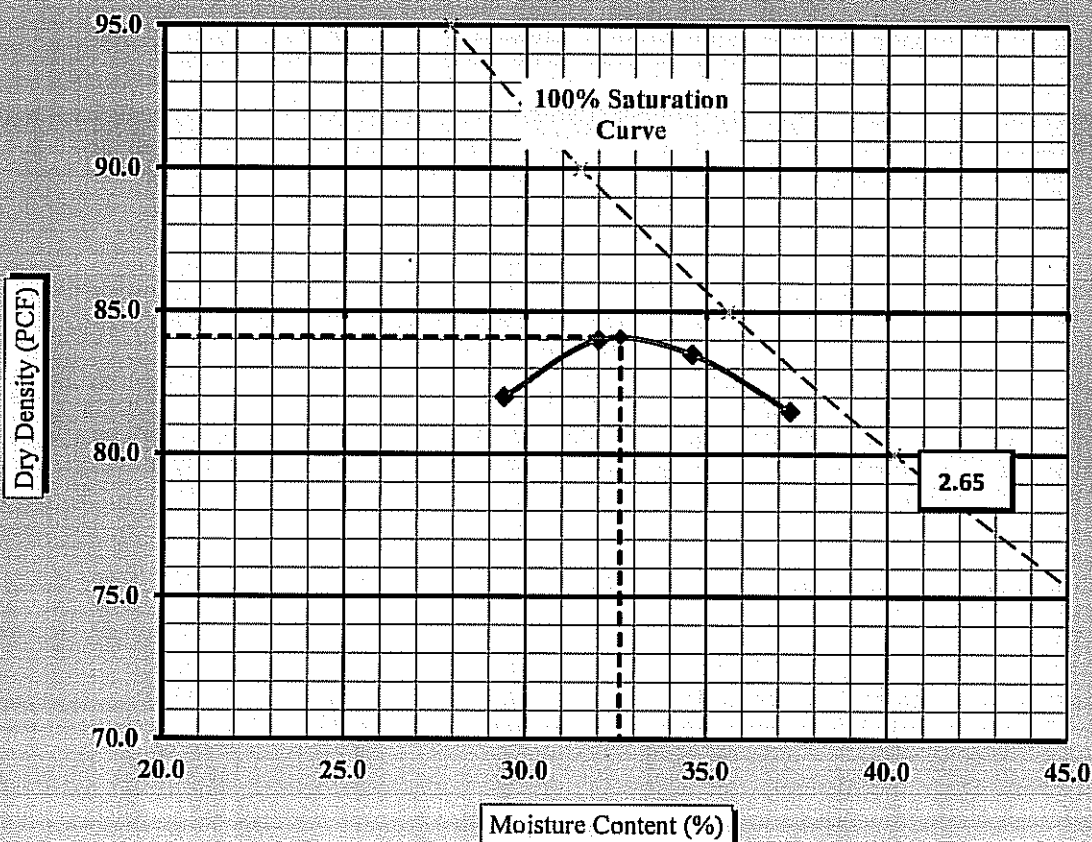
S&ME Project #:	1356-11-032	Phase 03	Report Date:	5/17/12	
Project Name:	Marshall Industrial Landfill No. 1 - Cells 3 & 4		Test Date(s):	5/15-17/12	
Client Name:	Duke Energy				
Client Address:	526 South Church Street, Charlotte, NC 28202				
Boring #:	NI	Sample #:	TP-6	Sample Date:	5/7/2012
Location:	Grid E2	Offset:	NI	Depth:	0-2'
Sample Description:	Tan Orange Silty Clay (CH) with Fine Sand				

Maximum Dry Density 84.1 PCF.

Optimum Moisture Content 32.6%

ASTM D 698 -- Method A

Moisture-Density Relations of Soil and Soil-Aggregate Mixtures



Soil Properties

Natural Moisture Content	ND
Specific Gravity of Soil (D854)	ND
Liquid Limit	82
Plastic Limit	347
Plastic Index	45

% Passing

3/4"	100.0%
3/8"	99.2%
#4	98.2%
#10	97.8%
#20	97.4%
#40	96.0%
#200	82.8%

Oversize Fraction

Bulk Gravity	
% Moisture	
% Oversize	
MDD	
Opt. MC	

Moisture-Density Curve Displayed: Fine Fraction ☒ Corrected for Oversize Fraction (ASTM D 4718) ☐
 Sieve Size used to separate the Oversize Fraction: #4 Sieve ☒ 3/8 inch Sieve ☐ 3/4 inch Sieve ☐
 Mechanical Rammer ☒ Manual Rammer ☐ Moist Preparation ☐ Dry Preparation ☒

References / Comments / Deviations: *ND = Not determined *NI = Information was not provided

ASTM D 2216: Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass

ASTM D 698: Laboratory Compaction Characteristics of Soil Using Standard Effort

Kyle Baucom
Technical Responsibility

[Signature]
Signature

[Signature]
Project Engineer
Position

6/1/12
Date

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Moisture - Density Relationship



ASTM D558, D698, D1557, AASHTO T99, T180

Quality Assurance

S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273

Project #:	1356-11-032	Phase 03	Report Date:	5/17/12
Project Name:	Marshall Industrial Landfill No. 1 - Cells 3 & 4		Test Date(s)	5/15-17/12
Client Name:	Duke Energy			
Client Address:	526 South Church Street, Charlotte, NC 28202			
Boring #:	NI	Sample #:	TP-6	Sample Date:
Location:	Grid E2	Offset:	NI	Depth:
Sample Description:	Tan Orange Silty Clay (CH) with Fine Sand			
Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #
Balance (0.1 g)	22182	6/8/2011	Compaction Mold	20231
Balance	22182	6/8/2011	Compaction Hammer	20222
Straightedge	20124	1/17/2012	Oven	10844
Sieve #4	10939	4/3/2012		
Water Content Water Content requires GP 2 Balance (0.1 gram Readability). Check:				
ASTM D2216 <input checked="" type="checkbox"/> AASHTO T265 <input type="checkbox"/> ASTM D4959 <input type="checkbox"/> ASTM D4643 <input type="checkbox"/>				
Water Added:		240	300	360
Tare #:		5F	SR	THAI
A. Tare Weight	A.	158.2	163.6	154.6
B. Wet Wt + Tare Wt	B.	1061.7	1084.5	1106.0
C. Dry Wt. + Tare Wt.	C.	856.3	861.1	861.4
D. Water Weight	B-C	205.4	223.4	244.6
E. Dry Weight	C-A	698.1	697.5	706.8
F. Moisture Content	100*D/E	29.4%	32.0%	34.6%
Compaction Data Requires a GP 5 Balance for ASTM (1 gram or .0022 Lb. readability). Check:				
ASTM D558 <input type="checkbox"/> ASTM D 698 <input checked="" type="checkbox"/> ASTM D1557 <input type="checkbox"/> AASHTO T99 <input type="checkbox"/> AASHTO T180 <input type="checkbox"/>				
Method A <input checked="" type="checkbox"/> Method B <input type="checkbox"/> Method C <input type="checkbox"/> Method D (ASTM 1978) <input type="checkbox"/> AASHTO Method D <input type="checkbox"/>				
G. Wt of Soil + Mold	G.	5842	5914	5937
H. Wt. of Mold	H.	4242	4242	4242
I. Wt. of Soil (g. or lbs.)	G-H	1600	1672	1695
J. Wt of Soil (Lbs.)	1/453.6 or I	3.527	3.686	3.737
K. Mold Volume Factor	K.	30.09	30.09	30.09
L. Wet Density (PCF)	J*K	106.1	110.9	112.4
M. Dry Density (PCF)	L/(1+F)	82.0	84.0	83.5
Sieve Size used to separate the Oversize Fraction: #4 Sieve <input checked="" type="checkbox"/> 3/8 inch Sieve <input type="checkbox"/> 3/4 inch Sieve <input type="checkbox"/>				
Mechanical Rammer <input checked="" type="checkbox"/> Manual Rammer <input type="checkbox"/> Moist Preparation <input type="checkbox"/> Dry Preparation <input checked="" type="checkbox"/>				

References / Comments / Deviations: *ND = Not determined *NI = Information was not provided

Jennifer Olsen
Technician Name

Signature
NICET/117926
Certification Type/No.5/17/2012
DateKyle Baucom
Technical Responsibility

Signature
Project Engineer
Position6/1/12
Date

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Particle Size Analysis of Soils

ASTM D 422



S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273

Project #:		1356-11-032 Phase 03		Report Date:		5/24/12	
Project Name:		Marshall Industrial Landfill No. 1- Cells 3 & 4					
Client Name:		Duke Energy					
Boring #:		NA		Sample #:		TP-6	
Location:		Grid E2		Offset:		NI	
Sample Description:		Tan Orange Silty Clay (CH) with Fine Sand					
Pan #:	Beaker #:	Apparent Relative Density (Assumed)		2.700			
Hydrometer Jar #:							
Pan Tare Weight (grams):							
Total Sample Air Dried Wt. + tare wt. (grams):		344.15		Tare #		57	
Weight of Total Sample Air Dried:		344.15		Tare Wt.		ND	
Weight of Air Dried Hydrometer Sample (g):		50.06		Wet Wt. + A		25.03	
Total Sample Oven Dried:		314.36		Dry Wt. + A		24.05	
Hydrometer Sample Oven Dried (W):		45.64		Water Wt. (B-C)		0.98	
% Passing #10:		97.8%		Dry Wt. (C-A)		10.12	
Correction Factor a (Table 1):		0.99		% Moisture (100 x D/E)		9.68%	
Description of Sand & Gravel Particles							
Stirring Apparatus:		A		Rounded		B	
Balance:		ID No. 3222		Cal Date: 6/23/2011		Hydrometer: ID No. 3901	
Control Cylinder		Composite Correction		Type: 151H		152H	
Time		Temp.		Hydrometer		Reading	
T (Min.)		(0.5 °C)		Control		Cylinder	
1		23.0		5.5		5.5	
2		23.0		5.5		5.5	
5		23.0		5.5		5.5	
15		23.0		5.5		5.5	
30		23.0		5.5		5.5	
60		23.5		5.0		5.0	
250		24.0		4.0		4.0	
1440		23.5		5.0		5.0	
References / Comments / Deviations							
ASTM D 422, D 2487, D 4318							
NI = Information not provided.							

Time	Temp.	Hydrometer	Reading	Control	Cylinder	Composite Correction	Hydrometer	Percent Passing	P (total) =	P (total) =	Effective	Depth	Table 3	Diameter
T (Min.)	(0.5 °C)	Control	Cylinder	Composite Correction	Hydrometer	Percent Passing	P (total) =	P (total) =	P (total) =	P (total) =	Effective	Depth	Table 3	Diameter
1	23.0	5.5	5.5	5.5	38.00	82.4%	80.6%	80.6%	80.6%	80.6%	10.1	0.01297	0.01297	0.04116
2	23.0	5.5	5.5	5.5	35.50	77.0%	75.3%	75.3%	75.3%	75.3%	10.5	0.01297	0.01297	0.02969
5	23.0	5.5	5.5	5.5	33.50	72.7%	71.1%	71.1%	71.1%	71.1%	10.8	0.01297	0.01297	0.01907
15	23.0	5.5	5.5	5.5	30.50	66.2%	64.7%	64.7%	64.7%	64.7%	11.3	0.01297	0.01297	0.01126
30	23.0	5.5	5.5	5.5	30.00	65.1%	63.7%	63.7%	63.7%	63.7%	11.4	0.01297	0.01297	0.00799
60	23.5	5.0	5.0	5.0	29.00	62.9%	61.5%	61.5%	61.5%	61.5%	11.5	0.01290	0.01290	0.00566
250	24.0	4.0	4.0	4.0	27.00	58.6%	57.3%	57.3%	57.3%	57.3%	11.9	0.01282	0.01282	0.00279
1440	23.5	5.0	5.0	5.0	25.00	54.2%	53.1%	53.1%	53.1%	53.1%	12.2	0.01290	0.01290	0.00119

Karen Warner
Technician Name

NICET 117900
Certification #

Kyle Baucom
Technical Responsibility

Project Engineer
Position

6/1/12
Date

Particle Size Analysis of Soils

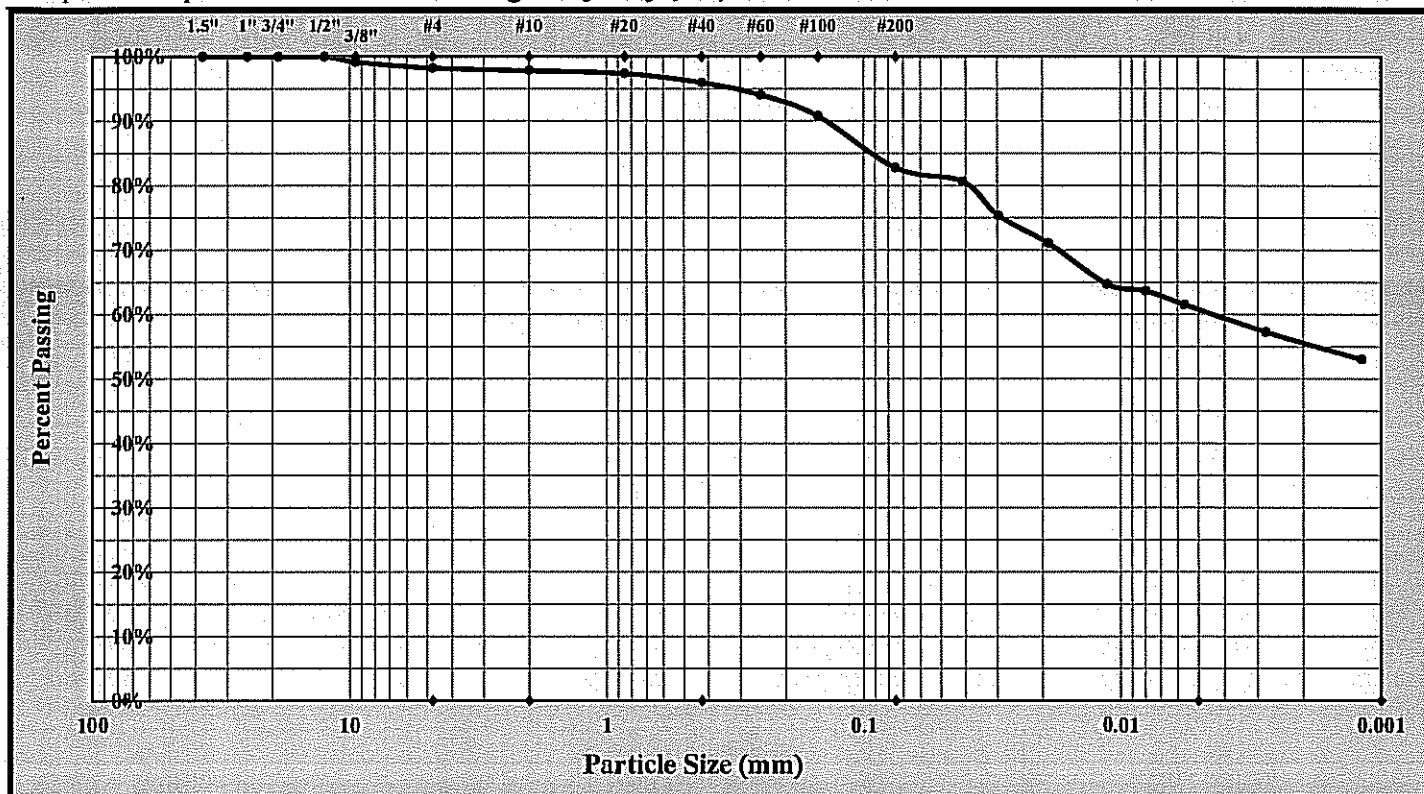


ASTM D422

Quality Assurance

S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273

S&ME Project #:	1356-11-032 Phase 03	Report Date:	5/24/12
Project Name:	Marshall Industrial Landfill No. 1- Cells 3 & 4	Test Date(s):	5/14/-24/12
Client Name:	Duke Energy		
Address:	526 South Church Street, Charlotte, NC		
Boring #:	NA	Sample #:	TP-6
		Sample Date:	5/7/12
Location:	Grid E2	Offset:	NI
		Elevation:	0-2'
Sample Description:	Tan Orange Silty Clay (CH) with Fine Sand		



Cobbles	< 300 mm (12\") and > 75 mm (3\")	Fine Sand	< 0.425 mm and > 0.075 mm (#200)
Gravel	< 75 mm and > 4.75 mm (#4)	Silt	< 0.075 and > 0.005 mm
Coarse Sand	< 4.75 mm and > 2.00 mm (#10)	Clay	< 0.005 mm
Medium Sand	< 2.00 mm and > 0.425 mm (#40)	Colloids	< 0.001 mm

Maximum Particle Size:	3/8"	Gravel:	1.8%	Silt	21.3%
Silt & Clay (% Passing #200):	82.8%	Total Sand:	15.5%	Clay	61.5%
Relative Density (Assumed)	2.700	Moisture Content		Colloids	
Liquid Limit	82	Plastic Limit	37	Plastic Index	45
Coarse Sand:	0.4%	Medium Sand:	1.9%	Fine Sand:	13.2%

Description of Sand and Gravel	Rounded <input type="checkbox"/>	Angular <input type="checkbox"/>	Hard & Durable <input type="checkbox"/>	Soft <input type="checkbox"/>	Weathered & Friable <input type="checkbox"/>
--------------------------------	----------------------------------	----------------------------------	---	-------------------------------	--

Mechanical Stirring Apparatus A	Dispersion Period:	1 min.	Dispersing Agent:	Sodium Hexametaphosphate:	40 g./ Liter
---------------------------------	--------------------	--------	-------------------	---------------------------	--------------

References / Comments / Deviations:	ASTM D 4318, D 2487 NI - Information not provided				
-------------------------------------	---	--	--	--	--

Technician Name:	Date:
------------------	-------

Kyle Baucom
Technical Responsibility

Signature

Project Engineer
Position

6/1/12
Date

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Liquid Limit, Plastic Limit, and Plastic Index



Another code

ASTM D 4318



AASHTO T 89



AASHTO T 90



Quality Assurance

S&ME, Inc. ~9751 Southern Pine Boulevard, Charlotte, NC 28273

Project #: 1356-11-032 Phase 03 Report Date: 5/31/12

Project Name: Marshall Industrial Landfill No. 1 - Cells 3 & 4 Test Date(s) 5/14-31/12

Client Name: Duke Energy

Client Address: 526 South Church Street, Charlotte, NC 28202

Boring #: NI Sample #: TP-6 Sample Date: 5/7/12

Location: Grid E2 Offset: NI Elevation: 0-2'

Sample Description: Tan Orange Silty Clay (CH) with Fine Sand

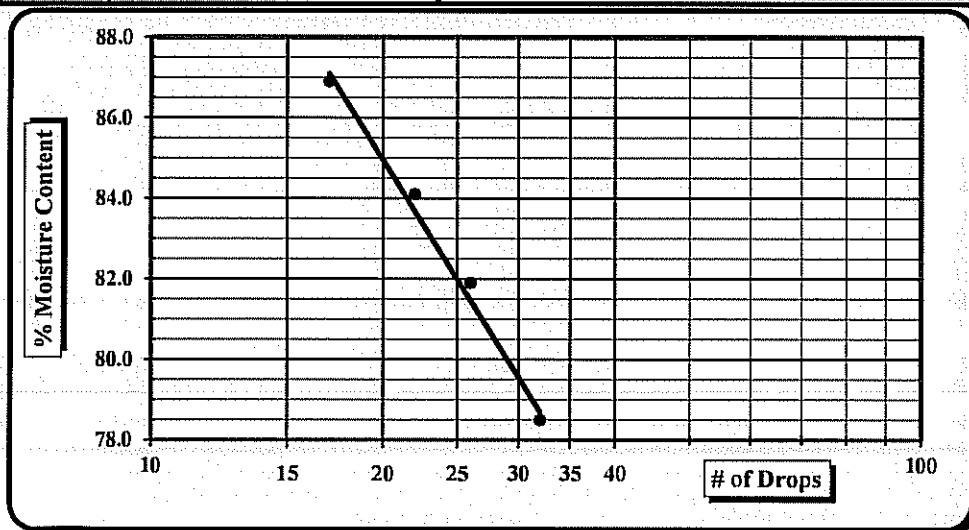
Type and Specification S&ME ID # Cal Date: Type and Specification S&ME ID # Cal Date:

Balance (0.01 g) 3222 6/23/2011 Grooving tool 22165 12/20/2011

LL Apparatus 20230 6/23/2011 Grooving tool

Oven 10844 5/9/2012 Grooving tool

Pan #	Tare #:	Liquid Limit					Plastic Limit		
		56	LL	17	MM		6	NN	
A	Tare Weight	15.69	16.96	14.00	16.57		14.04	15.31	
B	Wet Soil Weight + A	25.88	28.44	24.92	27.97		20.29	22.22	
C	Dry Soil Weight + A	21.40	23.27	19.93	22.67		18.62	20.37	
D	Water Weight (B-C)	4.48	5.17	4.99	5.30		1.67	1.85	
E	Dry Soil Weight (C-A)	5.71	6.31	5.93	6.10		4.58	5.06	
F	% Moisture (D/E)*100	78.5%	81.9%	84.1%	86.9%		36.5%	36.6%	
N	# OF DROPS	32	26	22	17		Moisture Contents determined by ASTM D 2216		
LL	LL = F * FACTOR								
Ave.	Average						36.6%		



One Point Liquid Limit			
N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic ☐

Liquid Limit 82

Plastic Limit 37

Plastic Index 45

Group Symbol CH

Multipoint Method ☒One-point Method ☐Wet Preparation ☐ Dry Preparation ☒ Air Dried ☒

Estimate the % Retained on the #40 Sieve:

Notes / Deviations / References: NI = Information not provided.

ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils

Jennifer Olsen
Technician NameJennifer Olsen 5/31/2012
DateKyle Baucom
Technical Responsibility6/1/12
Date

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Moisture - Density Report



Quality Assurance

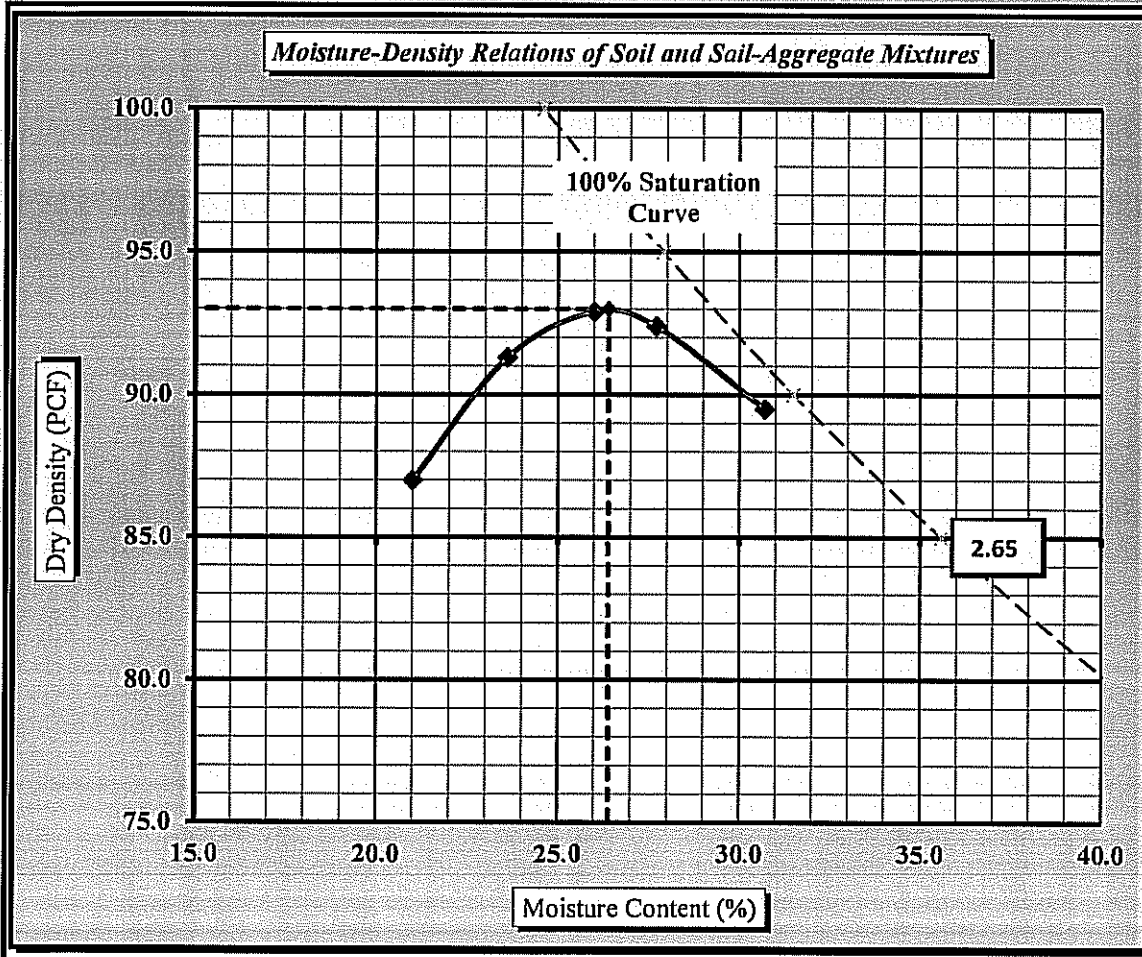
S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273

S&ME Project #:	1356-11-032	Phase 03	Report Date:	5/18/12	
Project Name:	Marshall Industrial Landfill No. 1 - Cells 3 & 4		Test Date(s):	5/16-18/12	
Client Name:	Duke Energy				
Client Address:	526 South Church Street, Charlotte, NC 28202				
Boring #:	NI	Sample #:	TP-8	Sample Date:	5/7/2012
Location:	Grid E3	Offset:	NI	Depth:	0-4'
Sample Description:	Orange Brown Silty Clay (CH) with Fine Sand				

Maximum Dry Density 93.0 PCF.

Optimum Moisture Content 26.4%

ASTM D 698 -- Method A



Soil Properties

Natural Moisture Content ND

Specific Gravity of Soil (D854) ND

Liquid Limit 65

Plastic Limit 31

Plastic Index 34

% Passing

3/4"	100.0%
3/8"	100.0%
#4	99.4%
#10	99.0%
#20	98.4%
#40	96.1%
#200	71.0%

Oversize Fraction

Bulk Gravity

% Moisture

% Oversize

MDD

Opt. MC

Moisture-Density Curve Displayed: Fine Fraction ☒ Corrected for Oversize Fraction (ASTM D 4718) ☐

Sieve Size used to separate the Oversize Fraction: #4 Sieve ☒ 3/8 inch Sieve ☐ 3/4 inch Sieve ☐

Mechanical Rammer ☒ Manual Rammer ☐ Moist Preparation ☐ Dry Preparation ☒

References / Comments / Deviations: *ND = Not determined *NI = Information was not provided

ASTM D 2216: Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass

ASTM D 698: Laboratory Compaction Characteristics of Soil Using Standard Effort

Kyle Baucom

Technical Responsibility

Signature

Position

Date

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Moisture - Density Relationship



ASTM D558, D698, D1557, AASHTO T99, T180

Quality Assurance

S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273

Project #:	1356-11-032	Phase 03	Report Date:	5/18/12		
Project Name:	Marshall Industrial Landfill No. 1 - Cells 3 & 4			Test Date(s)	5/16-18/12	
Client Name:	Duke Energy					
Client Address:	526 South Church Street, Charlotte, NC 28202					
Boring #:	NI	Sample #:	TP-8	Sample Date:	5/7/2012	
Location:	Grid E3	Offset:	NI	Depth:	0-4'	
Sample Description:	Orange Brown Silty Clay (CH) with Fine Sand					
Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #	Cal Date:	
Balance (0.1 g)	22182	6/8/2011	Compaction Mold	20231	1/6/2012	
Balance	22182	6/8/2011	Compaction Hammer	20222	6/6/2011	
Straightedge	20124	1/17/2012	Oven	10844	5/9/2012	
Sieve #4	10939	4/3/2012				
Water Content	Water Content requires GP 2 Balance (0.1 gram Readability).					
ASTM D2216 <input checked="" type="checkbox"/>	AASHTO T265 <input type="checkbox"/>	ASTM D4959 <input type="checkbox"/>		ASTM D4643 <input type="checkbox"/>		
Water Added:	300	360	420	240	180	
Tare #:	5I	AMRL	KO	5E	699	
A. Tare Weight	A.	162.8	163.6	165.3	157.6	155.4
B. Wet Wt + Tare Wt	B.	1127.9	1109.7	1141.6	1146.1	1174.6
C. Dry Wt. + Tare Wt.	C.	928.8	904.4	912.2	957.3	997.8
D. Water Weight	B-C	199.1	205.3	229.4	188.8	176.8
E. Dry Weight	C-A	766.0	740.8	746.9	799.7	842.4
F. Moisture Content	100*D/E	26.0%	27.7%	30.7%	23.6%	21.0%
Compaction Data	Requires a GP 5 Balance for ASTM (1 gram or .0022 Lb. readability).					
ASTM D558 <input type="checkbox"/>	ASTM D 698 <input checked="" type="checkbox"/>	ASTM D1557 <input type="checkbox"/>	AASHTO T99 <input type="checkbox"/>	AASHTO T180 <input type="checkbox"/>		
Method A <input checked="" type="checkbox"/>	Method B <input type="checkbox"/>	Method C <input type="checkbox"/>	Method D (ASTM 1978) <input type="checkbox"/>	AASHTO Method D <input type="checkbox"/>		
G. Wt of Soil + Mold	G.	6008	6020	6006	5943	5829
H. Wt. of Mold	H.	4242	4242	4242	4242	4242
I. Wt. of Soil (g. or lbs.)	G-H	1766	1778	1764	1701	1587
J. Wt of Soil (Lbs.)	1/453.6 or I	3.893	3.920	3.889	3.750	3.499
K. Mold Volume Factor	K.	30.09	30.09	30.09	30.09	30.09
L. Wet Density (PCF)	J*K	117.1	118.0	117.0	112.8	105.3
M. Dry Density (PCF)	L/(1+F)	92.9	92.4	89.5	91.3	87.0
Sieve Size used to separate the Oversize Fraction:		#4 Sieve <input checked="" type="checkbox"/>		3/8 inch Sieve <input type="checkbox"/>		3/4 inch Sieve <input type="checkbox"/>
Mechanical Rammer <input checked="" type="checkbox"/>		Manual Rammer <input type="checkbox"/>		Moist Preparation <input type="checkbox"/>		Dry Preparation <input checked="" type="checkbox"/>

References / Comments / Deviations: *ND = Not determined *NI = Information was not provided

Jennifer Olsen
Technician Name

Signature
NICET/117926
Certification Type/No.5/18/2012
DateKyle Bancom
Technical Responsibility

Signature

Position

Date

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Particle Size Analysis of Soils

ASTM D 422



S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273

Project #:		1356-11-032 Phase 03		Report Date:		5/24/12	
Project Name:		Marshall Industrial Landfill No. 1 - Cells 3 & 4		Test Date(s):		5/14/24/12	
Client Name:		Duke Energy		Address:		526 South Church Street, Charlotte, NC	
Boring #:		NA		Sample #:		TP-8	
Location:		Grid E3		Offset:		NI	
Sample Description:		Orange Brown Silty Clay (CH) with Fine Sand		Sample Date:		5/7/12	
		Elevation:		0-4'			
Pan #:	Beaker #:	Apparent Relative Density (Assumed)		2.700			
Hydrometer Jar #:							
Pan Tare Weight (grams):							
Total Sample Air Dried Wt. + tare wt. (grams):		335.61		Moisture Content		Hygroscopic	
Weight of Total Sample Air Dried:		335.61		Tare #		TT	
Weight of Air Dried Hydrometer Sample (g):		50.03		Wet Wt. + A		15.94	
Total Sample Oven Dried:		319.49		Dry Wt. + A		26.15	
Hydrometer Sample Oven Dried (W):		47.61		Water Wt. (B-C)		0.52	
% Passing #10:		99.0%		Dry Wt. (C-A)		10.21	
Correction Factor a (Table 1):		0.99		% Moisture (100 x D/E)		5.09%	
Description of Sand & Gravel Particles		Rounded		Angular		Hard & Durable	
Stirring Apparatus:		A		B		Soft	
Balance:		ID No. 3222		Cal. Date: 6/23/2011		Hydrometer: ID No. 3901	
Control Cylinder		Composite Correction		Type: 151H		152H	
Time		Temp.		Hydrometer		Reading	
T (Min.)		(0.5°C)		Control		Cylinder	
1		23.5		5.0		38.0	
2		23.5		5.0		36.0	
5		2.5		5.0		32.0	
15		23.5		5.0		30.5	
30		23.5		5.0		29.0	
60		23.5		5.0		27.0	
250		24.0		4.0		24.5	
1440		23.5		5.0		22.0	
Hydrometer		Composite Correction		Control		Cylinder	
Reading		38.0		5.0		38.0	
36.0		5.0		5.0		36.0	
32.0		5.0		5.0		32.0	
30.5		5.0		5.0		30.5	
29.0		5.0		5.0		29.0	
27.0		5.0		5.0		27.0	
24.5		4.0		4.0		24.5	
22.0		5.0		5.0		22.0	
Hydrometer		Composite Correction		Control		Cylinder	
Reading		38.0		5.0		38.0	
36.0		5.0		5.0		36.0	
32.0		5.0		5.0		32.0	
30.5		5.0		5.0		30.5	
29.0		5.0		5.0		29.0	
27.0		5.0		5.0		27.0	
24.5		4.0		4.0		24.5	
22.0		5.0		5.0		22.0	
Hydrometer		Composite Correction		Control		Cylinder	
Reading		38.0		5.0		38.0	
36.0		5.0		5.0		36.0	
32.0		5.0		5.0		32.0	
30.5		5.0		5.0		30.5	
29.0		5.0		5.0		29.0	
27.0		5.0		5.0		27.0	
24.5		4.0		4.0		24.5	
22.0		5.0		5.0		22.0	
Hydrometer		Composite Correction		Control		Cylinder	
Reading		38.0		5.0		38.0	
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29.0		5.0		5.0		29.0	
27.0		5.0		5.0		27.0	
24.5		4.0		4.0		24.5	
22.0		5.0		5.0		22.0	
Hydrometer		Composite Correction		Control		Cylinder	
Reading		38.0		5.0		38.0	
36.0		5.0		5.0		36.0	
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29.0		5.0		5.0		29.0	
27.0		5.0		5.0		27.0	
24.5		4.0		4.0		24.5	
22.0		5.0		5.0		22.0	
Hydrometer		Composite Correction		Control		Cylinder	
Reading		38.0		5.0		38.0	
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32.0		5.0		5.0		32.0	
30.5		5.0		5.0		30.5	
29.0		5.0		5.0		29.0	
27.0		5.0		5.0		27.0	
24.5		4.0		4.0		24.5	
22.0		5.0		5.0		22.0	
Hydrometer		Composite Correction		Control		Cylinder	
Reading		38.0		5.0		38.0	
36.0		5.0		5.0		36.0	
32.0		5.0		5.0		32.0	
30.5		5.0		5.0		30.5	
29.0		5.0		5.0		29.0	
27.0		5.0		5.0		27.0	
24.5		4.0		4.0		24.5	
22.0		5.0		5.0		22.0	
Hydrometer		Composite Correction		Control		Cylinder	
Reading		38.0		5.0		38.0	
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29.0		5.0		5.0		29.0	
27.0		5.0		5.0		27.0	
24.5		4.0		4.0		24.5	
22.0		5.0		5.0		22.0	
Hydrometer		Composite Correction		Control		Cylinder	
Reading		38.0		5.0		38.0	
36.0		5.0		5.0		36.0	
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30.5		5.0		5.0		30.5	
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27.0		5.0		5.0		27.0	
24.5		4.0		4.0		24.5	
22.0		5.0		5.0		22.0	
Hydrometer		Composite Correction		Control		Cylinder	
Reading		38.0		5.0		38.0	
36.0		5.0		5.0		36.0	
32.0		5.0		5.0		32.0	
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29.0		5.0		5.0		29.0	
27.0		5.0		5.0		27.0	
24.5		4.0		4.0		24.5	
22.0		5.0		5.0		22.0	
Hydrometer		Composite Correction		Control		Cylinder	
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29.0		5.0		5.0		29.0	
27.0		5.0		5.0		27.0	
24.5		4.0		4.0		24.5	
22.0		5.0		5.0		22.0	
Hydrometer		Composite Correction		Control		Cylinder	
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30.5		5.0		5.0		30.5	
29.0		5.0		5.0		29.0	
27.0		5.0		5.0		27.0	
24.5		4.0		4.0		24.5	
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Hydrometer		Composite Correction		Control		Cylinder	
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36.0		5.0		5.0		36.0	
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30.5		5.0		5.0		30.5	
29.0		5.0		5.0		29.0	
27.0		5.0		5.0		27.0	
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27.0		5.0		5.0		27.0	
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Hydrometer		Composite Correction		Control		Cylinder	
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Reading		38.0		5.0		38.0	
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Hydrometer		Composite Correction		Control		Cylinder	
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32.0		5.0		5.0		32.0	
30.5		5.0		5.0		30.5	
29.0		5.0		5.0		29.0	
27.0		5.0		5.0		27.0	
24.5		4.0		4.0		24.5	
22.0		5.0		5.0		22.0	
Hydrometer		Composite Correction		Control		Cylinder	
Reading		38.0		5.0		38.0	
36.0		5.0					

Particle Size Analysis of Soils

ASTM D422

Quality Assurance



S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273

S&ME Project #: 1356-11-032 Phase 03

Report Date: 5/24/12

Project Name: Marshall Industrial Landfill No. 1- Cells 3 & 4

Test Date(s): 5/14/-24/12

Client Name: Duke Energy

Address: 526 South Church Street, Charlotte, NC

Boring #: NA

Sample #: TP-8

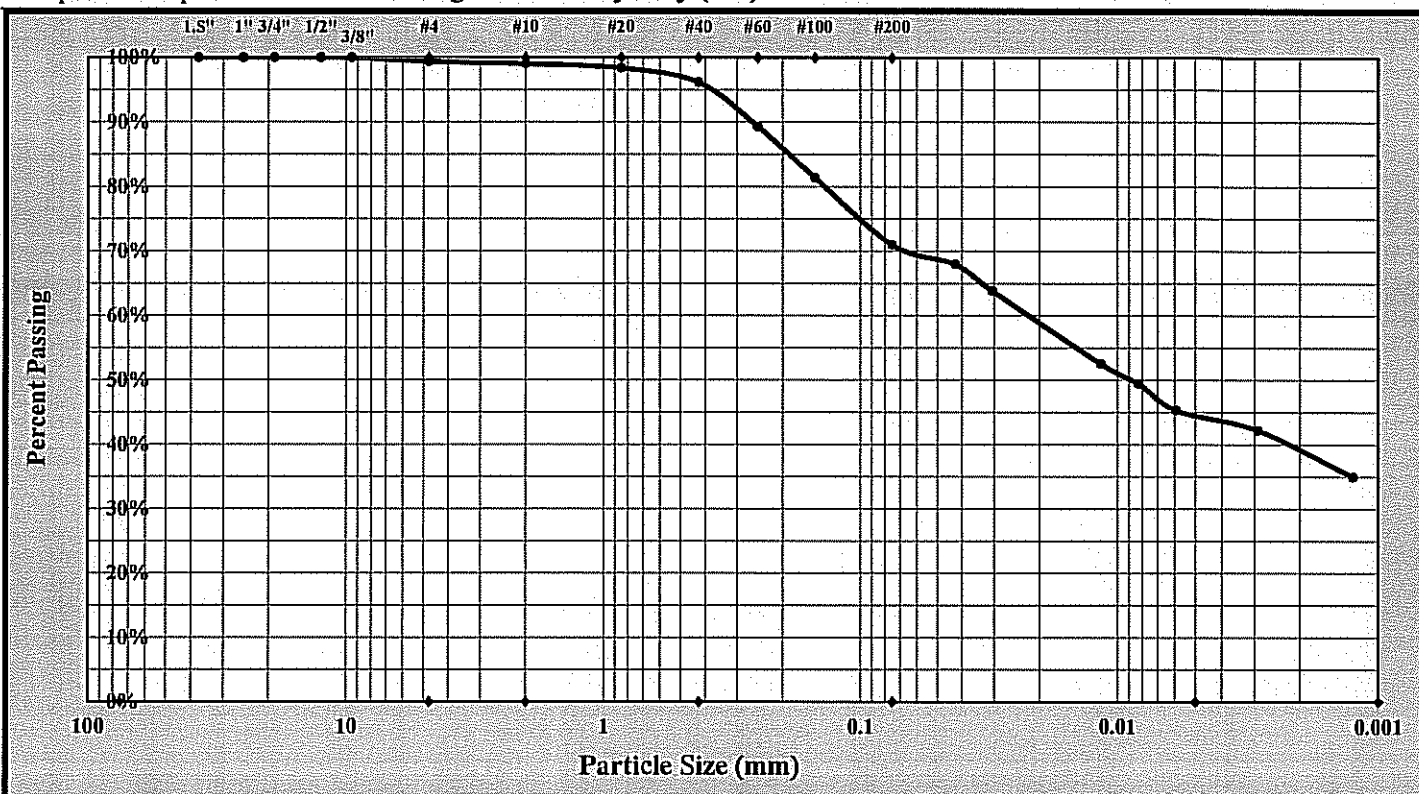
Sample Date: 5/7/12

Location: Grid E3

Offset: NI

Elevation: 0-4'

Sample Description: Orange Brown Silty Clay (CH) with Fine Sand



Cobbles	< 300 mm (12") and > 75 mm (3")	Fine Sand	< 0.425 mm and > 0.075 mm (#200)
Gravel	< 75 mm and > 4.75 mm (#4)	Silt	< 0.075 and > 0.005 mm
Coarse Sand	< 4.75 mm and > 2.00 mm (#10)	Clay	< 0.005 mm
Medium Sand	< 2.00 mm and > 0.425 mm (#40)	Colloids	< 0.001 mm

Maximum Particle Size:	#4	Gravel:	0.6%	Silt	26.5%
Silt & Clay (% Passing #200):	71.0%	Total Sand:	28.4%	Clay	44.5%
Unit Relative Density (Assumed)	2.700	Moisture Content		Colloids	
Liquid Limit	65	Plastic Limit	31	Plastic Index	34
Coarse Sand:	0.4%	Medium Sand:	2.9%	Fine Sand:	25.2%

Description of Sand and Gravel Rounded ☐ Angular ☐ Hard & Durable ☐ Soft ☐ Weathered & Friable ☐

Mechanical Stirring Apparatus A	Dispersion Period:	1 min.	Dispersing Agent:	Sodium Hexametaphosphate:	40 g./Liter
---------------------------------	--------------------	--------	-------------------	---------------------------	-------------

References / Comments / Deviations: ASTM D 4318, D 2487 NI = Information not provided

Technician Name: _____ Date: _____

Kyle Baucom
Technical Responsibility


Signature

Project Engineer
Position

6/1/12
Date

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Liquid Limit, Plastic Limit, and Plastic Index

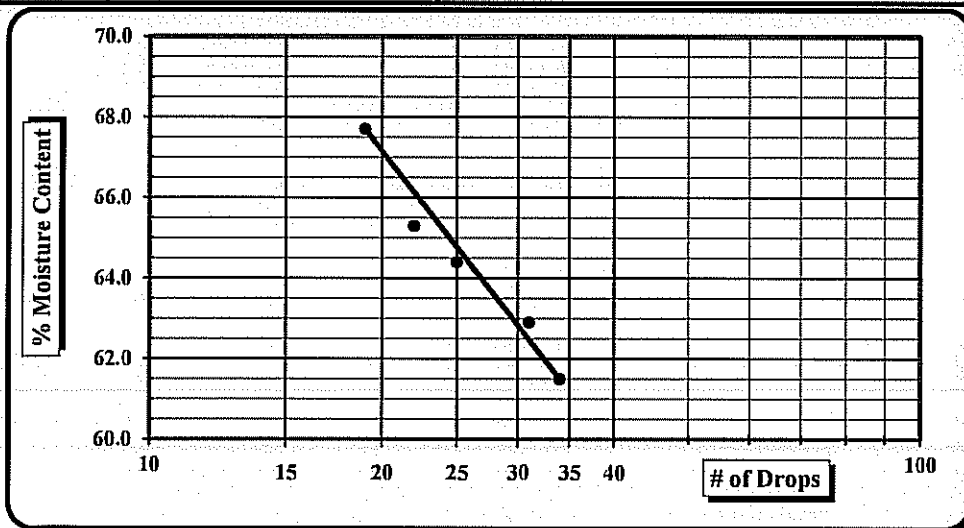


S&ME, Inc. ~9751 Southern Pine Boulevard, Charlotte, NC 28273

Project #:	1356-11-032	Phase 03	Report Date:	5/31/12
Project Name:	Marshall Industrial Landfill No. 1 - Cells 3 & 4		Test Date(s)	5/14-31/12
Client Name:	Duke Energy			
Client Address:	526 South Church Street, Charlotte, NC 28202			
Boring #:	NI	Sample #:	TP-8	Sample Date:
Location:	Grid E3	Offset:	NI	Elevation:
Sample Description:	Orange Brown Silty Clay (CH) with Fine Sand			

Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #	Cal Date:
Balance (0.01 g)	3222	6/23/2011	Grooving tool	22165	12/20/2011
LL Apparatus	20230	6/23/2011	Grooving tool		
Oven	10844	5/9/2012	Grooving tool		

Pan #	Tare #:	Liquid Limit					Plastic Limit	
		12	NN	59	6	25	9	37
A	Tare Weight	14.19	15.29	15.81	14.04	14.38	13.93	15.90
B	Wet Soil Weight + A	27.06	28.19	26.86	24.90	25.65	20.04	22.63
C	Dry Soil Weight + A	22.16	23.21	22.53	20.61	21.10	18.58	21.02
D	Water Weight (B-C)	4.90	4.98	4.33	4.29	4.55	1.46	1.61
E	Dry Soil Weight (C-A)	7.97	7.92	6.72	6.57	6.72	4.65	5.12
F	% Moisture (D/E)*100	61.5%	62.9%	64.4%	65.3%	67.7%	31.4%	31.4%
N	# OF DROPS	34	31	25	22	19	Moisture Contents determined by ASTM D 2216	
LL	LL = F * FACTOR							
Ave.	Average						31.4%	



One Point Liquid Limit			
N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic ☐Liquid Limit **65**Plastic Limit **31**Plastic Index **34**Group Symbol **CH**Multipoint Method ☒One-point Method ☐Wet Preparation ☐ Dry Preparation ☒ Air Dried ☒

Estimate the % Retained on the #40 Sieve:

Notes / Deviations / References: NI = Information not provided.

ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils

Jennifer Olsen
Technician NameJennifer Olsen 5/31/2012
DateKyle Baucom
Technical Responsibility6/1/12
Date

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Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter (Method "F")

Project #:	1356-11-032	Phase 03	Test Date(s):	5/20-24/12
Project Name:	Marshall Industrial Landfill No.1 - Cells 3 & 4		Report Date:	5/24/12
Client Name:	Duke Energy		Sample Date:	5/7/2012
Client Address:	528 South Church Street, Charlotte, NC 28202		Panel ID:	4

Boring #:	NA	Sample #:	TP-9	Depth:	4'-7"	Perm Cell ID:
Location:	Grid H	Offset:	Sample Description: Tan Orange Fine Sandy Clayey Silt (ML)			

	Liquid Limit:	40	Sp. Grav. (Assumed):	2.700	Sample Type:	Remolded	Log #:
	Plastic Limit:	32			Percent Passing #200:	8	Maximum Particle Size: #4
					Plastic Index:	54.8%	

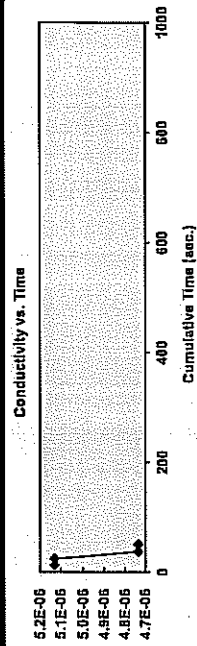
[illegible]

Permeometer P700000 by Trautwein Soil Testing was used for permeation.

ASTM D 5084: Measurement of Hydraulic Conductivity of Saturated Porous

Materials Using a Flexible Wall Permeameter

ASTM D 2216: Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass



Technician: Karen Warner
Technical Responsibility: Kyle Baucom

Signature

Kyle Baucum

Position:

Signature 

SS&ME, INC., 1413 Tappan Rd., Louisville, TN 37777

1356-11-032 Phase 03 TP-9 (4-7') Perm.xls

Moisture - Density Report



Quality Assurance

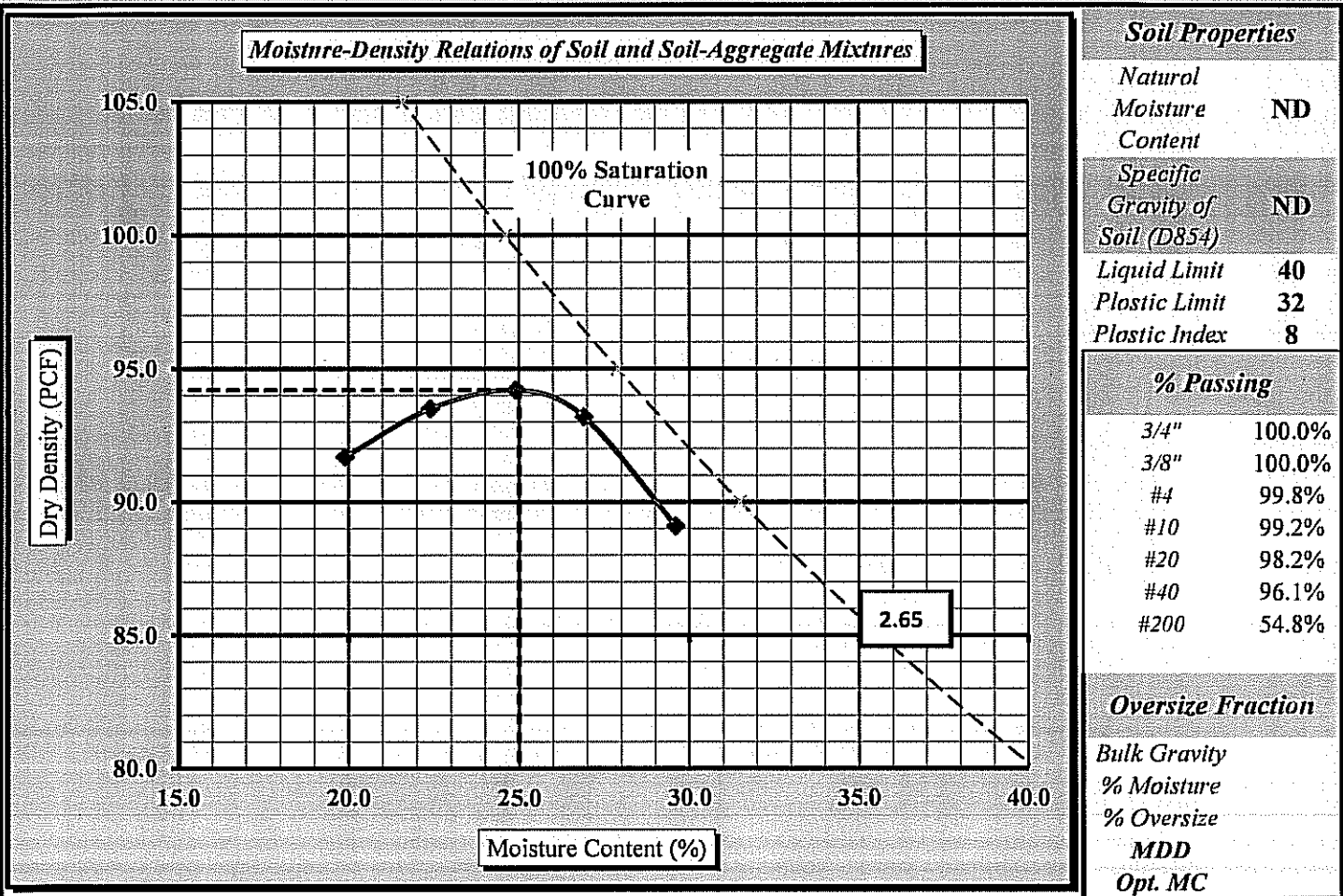
S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273

S&ME Project #:	1356-11-032	Phase 03	Report Date:	5/18/12	
Project Name:	Marshall Industrial Landfill No. 1 - Cells 3 & 4		Test Date(s):	5/16-18/12	
Client Name:	Duke Energy				
Client Address:	526 South Church Street, Charlotte, NC 28202				
Boring #:	NI	Sample #:	TP-9	Sample Date:	5/7/2012
Location:	Grid H	Offset:	NI	Depth:	4-7'
Sample Description:	Tan Orange Fine Sandy Clayey Silt (ML)				

Maximum Dry Density 94.2 PCF.

Optimum Moisture Content 25.0%

ASTM D 698 -- Method A



Moisture-Density Curve Displayed: Fine Fraction ☒ Corrected for Over Size Fraction (ASTM D 4718) ☐
 Sieve Size used to separate the Over Size Fraction: #4 Sieve ☒ 3/8 inch Sieve ☐ 3/4 inch Sieve ☐
 Mechanical Rammer ☒ Manual Rammer ☐ Moist Preparation ☐ Dry Preparation ☒

References / Comments / Deviations: *ND = Not determined *NI = Information was not provided

ASTM D 2216: Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass

ASTM D 698: Laboratory Compaction Characteristics of Soil Using Standard Effort

Kyle Baucom
Technical Responsibility

Signature

Position

6/1/12
Date

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Moisture - Density Relationship



ASTM D558, D698, D1557, AASHTO T99, T180

Quality Assurance

S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273

Project #:	1356-11-032	Phase 03	Report Date:	5/18/12
Project Name:	Marshall Industrial Landfill No. 1 - Cells 3 & 4		Test Date(s)	5/16-18/12
Client Name:	Duke Energy			
Client Address:	526 South Church Street, Charlotte, NC 28202			
Boring #:	NI	Sample #:	TP-9	Sample Date: 5/7/2012
Location:	Grid H	Offset:	NI	Depth: 4-7'
Sample Description:	Tan Orange Fine Sandy Clayey Silt (ML)			
Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID # Cal Date:
Balance (0.1 g)	22182	6/8/2011	Compaction Mold	20231 1/6/2012
Balance	22182	6/8/2011	Compaction Hammer	20222 6/6/2011
Straightedge	20124	1/17/2012	Oven	10844 5/9/2012
Sieve #4	10939	4/3/2012		
Water Content Water Content requires GP 2 Balance (0.1 gram Readability). Check:				
ASTM D2216 <input checked="" type="checkbox"/>	AASHTO T265 <input type="checkbox"/>	ASTM D4959 <input type="checkbox"/>	ASTM D4643 <input type="checkbox"/>	
Water Added:	240	300	360	420
Tare #:	THAI	5F	5A	SR
A. Tare Weight	A. 154.5	158.0	159.7	163.5
B. Wet Wt + Tare Wt	B. 1111.1	1207.0	1165.0	1168.3
C. Dry Wt. + Tare Wt.	C. 952.2	1015.1	964.9	955.1
D. Water Weight	B-C 158.9	191.9	200.1	213.2
E. Dry Weight	C-A 797.7	857.1	805.2	791.6
F. Moisture Content	100*D/E 19.9%	22.4%	24.9%	26.9%
Compaction Data Requires a GP 5 Balance for ASTM (1 gram or .0022 Lb. readability). Check:				
ASTM D558 <input type="checkbox"/>	ASTM D 698 <input checked="" type="checkbox"/>	ASTM D1557 <input type="checkbox"/>	AASHTO T99 <input type="checkbox"/>	AASHTO T180 <input type="checkbox"/>
Method A <input checked="" type="checkbox"/>	Method B <input type="checkbox"/>	Method C <input type="checkbox"/>	Method D (ASTM 1978) <input type="checkbox"/>	AASHTO Method D <input type="checkbox"/>
G. Wt of Soil + Mold	G. 5900	5968	6014	6026
H. Wt. of Mold	H. 4242	4242	4242	4242
I. Wt. of Soil (g. or lbs.)	G-H 1658	1726	1772	1784
J. Wt of Soil (Lbs.)	I/453.6 or I 3.655	3.805	3.907	3.933
K. Mold Volume Factor	K. 30.09	30.09	30.09	30.09
L. Wet Density (PCF)	J*K 110.0	114.5	117.6	118.3
M. Dry Density (PCF)	L/(1+F) 91.7	93.5	94.2	93.2
Sieve Size used to separate the Oversize Fraction: #4 Sieve <input checked="" type="checkbox"/> 3/8 inch Sieve <input type="checkbox"/> 3/4 inch Sieve <input type="checkbox"/>				
Mechanical Rammer <input checked="" type="checkbox"/> Manual Rammer <input type="checkbox"/> Moist Preparation <input type="checkbox"/> Dry Preparation <input checked="" type="checkbox"/>				

References / Comments / Deviations: *ND = Not determined *NI = Information was not provided

Jennifer Olsen
Technician Name

Signature
NICET/117926
Certification Type/No.5/18/2012
DateKyle Baucom
Technical Responsibility

Signature

Position

Date

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Particle Size Analysis of Soils

ASTM D 422



S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273

Project #:		1356-11-032 Phase 03		Report Date:		5/24/12	
Project Name:		Marshall Industrial Landfill No. 1 - Cells 3 & 4 Test Date(s): 5/14/24/12					
Client Name:		Duke Energy					
Boring #:		NA		Sample #:		TP-9	
Location:		Grid H		Offset:		ND	
Sample Description:		Tan Orange Fine Sandy Clayey Silt (ML)					
Pan #:		Beaker #:		Apparent Relative Density (Assumed):		2.700	
Hydrometer Jar #:							
Pan Tare Weight (grams):				Moisture Content		Hygroscopic	
Total Sample Air Dried Wt. + tare wt. (grams):		322.96		Tare #		2	
Weight of Total Sample Air Dried:		322.96		Tare Wt.		15.79	
Weight of Air Dried Hydrometer Sample (g):		50.03		Wet Wt. + A		26.04	
Total Sample Oven Dried:		302.32		Dry Wt. + A		25.38	
Hydrometer Sample Oven Dried (W):		46.81		Water Wt. (B-C)		0.66	
% Passing #10:		99.2%		Dry Wt. (C-A)		9.59	
Correction Factor a (Table 1):		0.99		% Moisture (100 x D/E)		6.88%	
Description of Sand & Gravel Particles							
Stirring Apparatus:		A		Rounded		B	
Balance:		ID No. 3222		Cal. Date: 6/23/2011		Hydrometer: ID No. 3901	
Control Cylinder		Composite Correction		Type:		151H	
Time		Temp.		Hydrometer		Hydrometer	
T (Min.)		(0.5°C)		Reading		Composite	
1		23.0		28.5		5.5	
2		23.0		25.5		5.5	
5		23.0		22.0		5.5	
15		23.0		19.0		5.5	
30		23.0		17.0		5.5	
60		23.5		16.0		5.0	
250		24.0		14.0		4.0	
1440		23.5		13.0		5.0	
References / Comments / Deviations							
ASTM D 422, D 2487, D 4318							

NI = Information not provided.

Karen Warner

Technician Name

NICET 117900

Certification #

Kyle Baucom

Technical Responsibility

Project Engineer

Position

6/1/12

Date

Particle Size Analysis of Soils

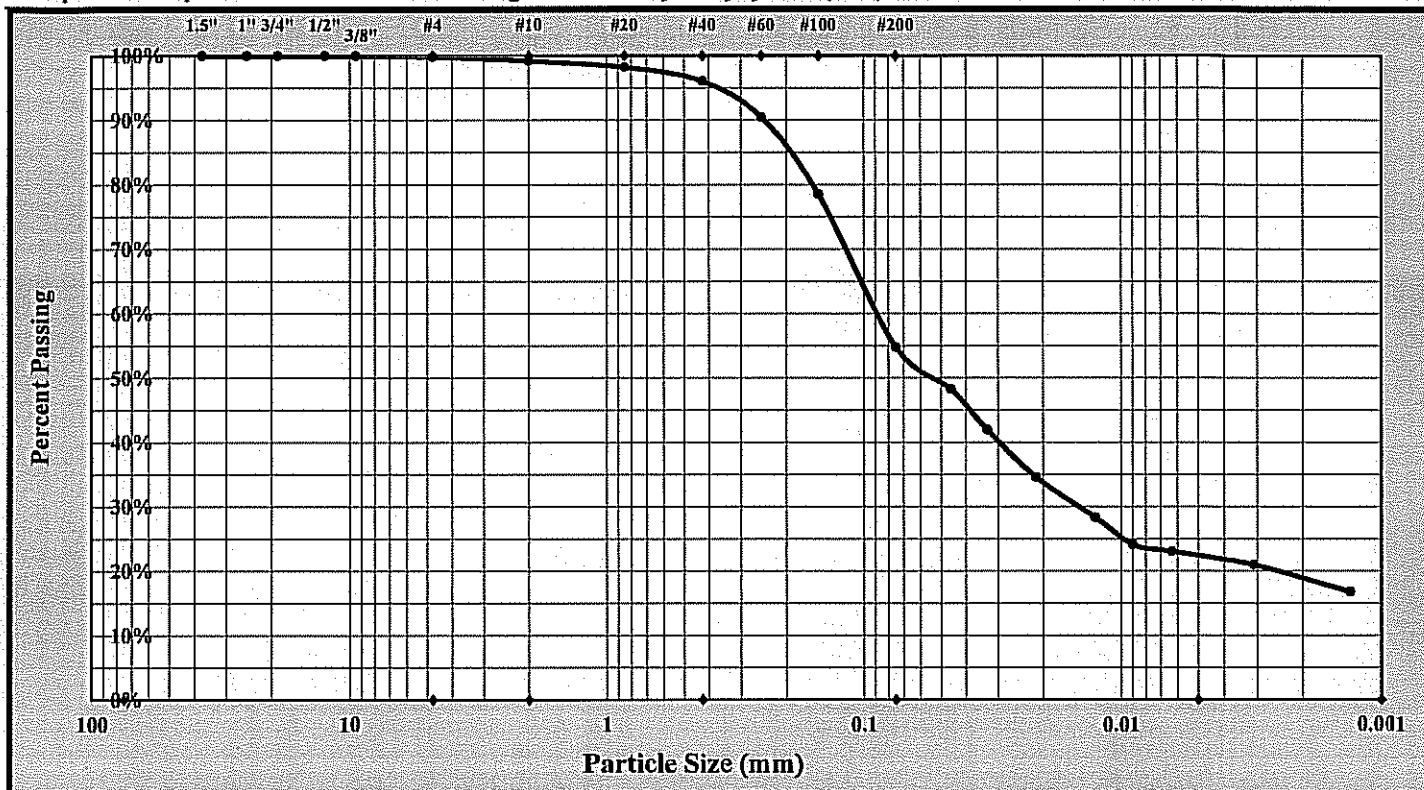


ASTM D422

Quality Assurance

S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273

S&ME Project #:	1356-11-032 Phase 03	Report Date:	5/24/12
Project Name:	Marshall Industrial Landfill No. 1- Cells 3 & 4	Test Date(s):	5/14-24/12
Client Name:	Duke Energy		
Address:	526 South Church Street, Charlotte, NC		
Boring #:	NA	Sample #:	TP-9
		Sample Date:	5/7/12
Location:	Grid H	Offset:	ND
		Elevation:	4-7'
Sample Description:	Tan Orange Fine Sandy Clayey Silt (ML)		



Cobbles	< 300 mm (12\") and > 75 mm (3\")	Fine Sand	< 0.425 mm and > 0.075 mm (#200)
Gravel	< 75 mm and > 4.75 mm (#4)	Silt	< 0.075 and > 0.005 mm
Coarse Sand	< 4.75 mm and > 2.00 mm (#10)	Clay	< 0.005 mm
Medium Sand	< 2.00 mm and > 0.425 mm (#40)	Colloids	< 0.001 mm

Maximum Particle Size:	#4	Gravel:	0.2%	Silt	31.8%
Silt & Clay (% Passing #200):	54.8%	Total Sand:	45.0%	Clay	23.0%
Relative Density (Assumed)	2.700	Moisture Content		Colloids	
Liquid Limit	40	Plastic Limit	32	Plastic Index	8
Coarse Sand:	0.6%	Medium Sand:	3.2%	Fine Sand:	41.3%
Description of Sand and Gravel	Rounded <input type="checkbox"/> Angular <input type="checkbox"/>	Hard & Durable <input type="checkbox"/> Soft <input type="checkbox"/>	Weathered & Friable <input type="checkbox"/>		
Mechanical Stirring Apparatus A	Dispersion Period: 1 min.	Dispersing Agent:	Sodium Hexametaphosphate:	40 g./ Liter	

References / Comments / Deviations: ASTM D 4318, D 854, D 2487

Technician Name: _____ Date: _____

Kyle Baucom
Technical Responsibility

Signature

Project Engineer
Position

5/1/12
Date

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Liquid Limit, Plastic Limit, and Plastic Index



Another code

ASTM D 4318



AASHTO T 89



AASHTO T 90



Quality Assurance

S&ME, Inc. ~9751 Southern Pine Boulevard, Charlotte, NC 28273

Project #: 1356-11-032

Phase 03

Report Date: 5/31/12

Project Name: Marshall Industrial Landfill No. 1 - Cells 3 & 4

Test Date(s) 5/14-31/12

Client Name: Duke Energy

Client Address: 526 South Church Street, Charlotte, NC 28202

Boring #: NI

Sample #: TP-9

Sample Date: 5/7/12

Location: Grid H

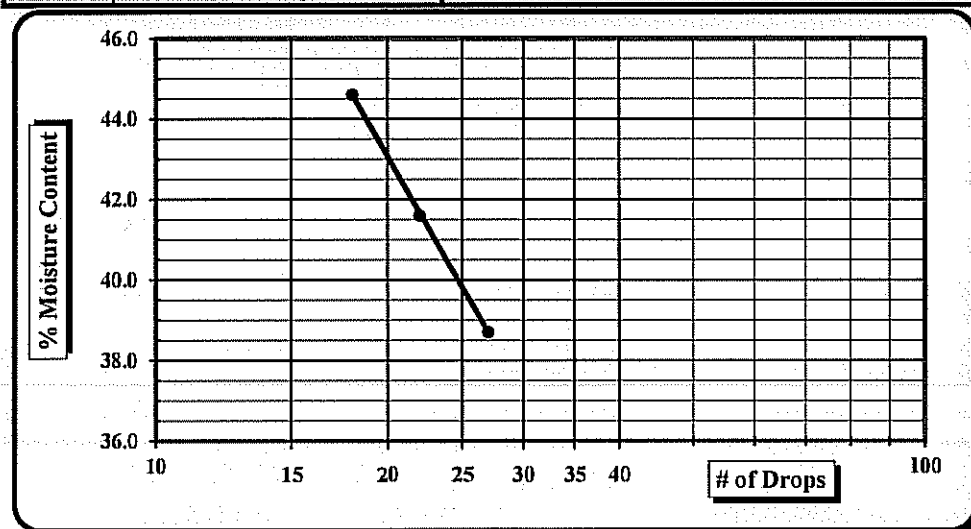
Offset: NI

Elevation: 4-7'

Sample Description: Tan Orange Fine Sandy Clayey Silt (ML)

Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #	Cal Date:
Balance (0.01 g)	3222	6/23/2011	Grooving tool	22165	12/20/2011
LL Apparatus	20230	6/23/2011	Grooving tool		
Oven	10844	5/9/2012	Grooving tool		

Pan #	Tare #:	Liquid Limit						Plastic Limit	
		BB	30	TT				WN	P-11
A	Tare Weight	16.18	15.89	15.91				16.60	12.58
B	Wet Soil Weight + A	32.23	29.17	32.47				23.59	18.76
C	Dry Soil Weight + A	27.75	25.27	27.36				21.89	17.26
D	Water Weight (B-C)	4.48	3.90	5.11				1.70	1.50
E	Dry Soil Weight (C-A)	11.57	9.38	11.45				5.29	4.68
F	% Moisture (D/E)*100	38.7%	41.6%	44.6%				32.1%	32.1%
N	# OF DROPS	27	22	18				Moisture Contents determined by ASTM D 2216	
LL	LL = F * FACTOR								
Ave.	Average							32.1%	



One Point Liquid Limit			
N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic ☐

Liquid Limit 40

Plastic Limit 32

Plastic Index 8

Group Symbol ML

Multipoint Method ☒One-point Method ☐Wet Preparation ☐ Dry Preparation ☒ Air Dried ☒

Estimate the % Retained on the #40 Sieve:

Notes / Deviations / References: NI = Information not provided.

ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils

Jennifer Olsen
Technician NameJennifer J Olsen 5/31/2012
DateKyle Baucom
Technical Responsibility5/1/12
Date

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Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter (Method "F")

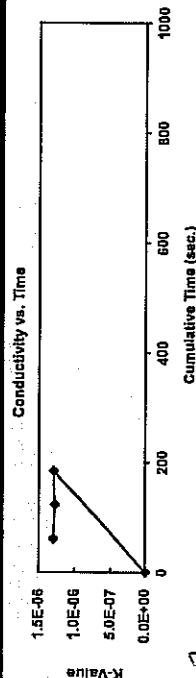
Project #:	1356-14-032	Phase 03	
Project Name:	Marshall Industrial Landfill No.1 - Cells 3 & 4		
Client Name:	Duke Energy		
Client Address:	526 South Church Street, Charlotte, NC 28202		
Test Date(s):			8/28-7/5/12
Report Date:			7/5/12
Sample Date:			6/16/2012
Panel ID:			8

Boring #:	NA	Sample #:	CSL-1	Depth:	0-5'	Perm Cell ID:
Location:	Grid B3	Offset:	NA	Sample Description: Orange Brown Clay w/Coarse to Fine Sand (CH)		
Liquid Limit:	61	Sp. Grav. (Assumed):	2.700	Sample Type: Remolded		
				Log #: NA		

[illegible]

References:

ASTM D 5084: Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter
ASTM D 2216: Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass



Technician: Karen Warner Signature: *Karen Warner* Position: Project Engineer
 Technical Responsibility: Kyle Gaulcom

Liquid Limit, Plastic Limit, and Plastic Index



Another code

ASTM D 4318



AASHTO T 89



AASHTO T 90



Quality Assurance

S&ME, Inc. ~9751 Southern Pine Boulevard, Charlotte, NC 28273

Project #: 1356-11-032 Phase 03

Report Date: 6/27/12

Project Name: Marshall Industrial Landfill No. 1- Cells 3&4

Test Date(s) 6/20-27/12

Client Name: Duke Energy

Client Address: 526 South Church Street, Charlotte, NC 28202

Boring #: NA

Sample #: CSL-1

Sample Date: 6/19/12

Location: Grid B3

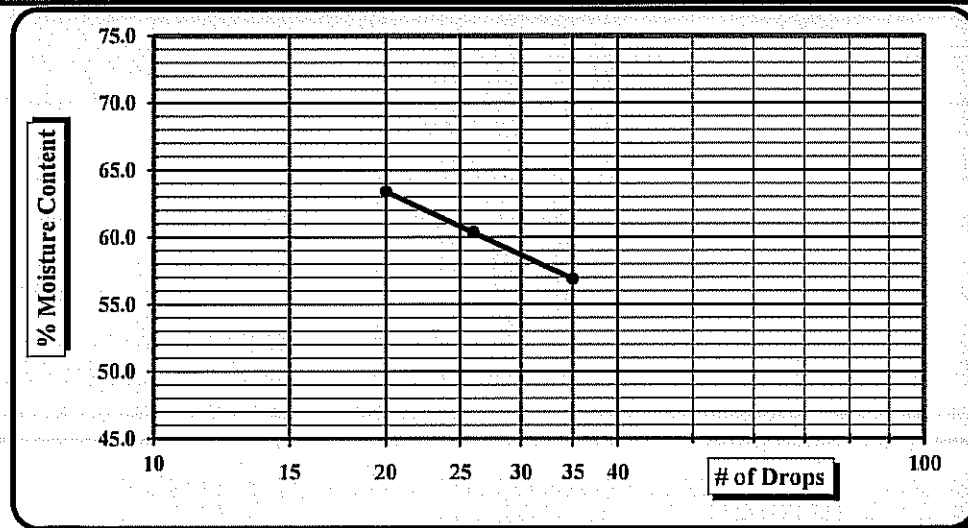
Offset: NA

Elevation: 0-6'

Sample Description: Orange Brown Clay w/Coarse to Fine Sand (CH)

Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #	Cal Date:
Balance (0.01 g)	3222	6/25/2012	Grooving tool	20165	12/20/2011
LL Apparatus	20230	6/26/2012	Grooving tool		
Oven	10844	5/9/2012	Grooving tool		

Pan #	Tare #:	Liquid Limit					Plastic Limit		
		Cupid	Ron	Beta			Bugs	111	
A	Tare Weight	8.33	8.42	14.54			14.66	14.50	
B	Wet Soil Weight + A	17.95	18.83	24.77			21.09	20.80	
C	Dry Soil Weight + A	14.46	14.91	20.80			19.56	19.32	
D	Water Weight (B-C)	3.49	3.92	3.97			1.53	1.48	
E	Dry Soil Weight (C-A)	6.13	6.49	6.26			4.90	4.82	
F	% Moisture (D/E)*100	56.9%	60.4%	63.4%			31.2%	30.7%	
N	# OF DROPS	35	26	20			Moisture Contents determined by ASTM D 2216		
LL	LL = F * FACTOR								
Ave.	Average						31.0%		



One Point Liquid Limit			
N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic ☐

Liquid Limit 61

Plastic Limit 31

Plastic Index 30

Group Symbol CH

Multipoint Method ☒One-point Method ☐Wet Preparation ☐ Dry Preparation ☒ Air Dried ☒

Estimate the % Retained on the #40 Sieve:

Notes / Deviations / References:

ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils

Karen Warner

Technician Name

6/27/2012

Date

Kyle Baucom

Technical Responsibility

7/2/12

Date

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Particle Size Analysis of Soils

ASTM D 422



S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273

Project #: 1356-11-032 Phase 03

Report Date: 6/27/12

Project Name: Marshall Industrial Landfill No.1 - Cells 3 & 4 Test Date(s): 6/20-27/12

Client Name: Duke Energy Address: 526 S. Church Street, Charlotte, NC 28202

Boring #: NA Sample #: CSL-1 Sample Date: 6/19/12

Location: Grid B3 Offset: NA Elevation: 0-6'

Sample Description: Orange Brown Clay w/Coarse to Fine Sand (CH)

Pan #:	Beaker #:	Apparent Relative Density (Assumed)	2.700	Sieve	Retained Wt.	Percent Passing
Hydrometer Jar #:				3/0"	0.0	100.0%
Pan Tare Weight (grams):				1.5"	0.0	100.0%
Total Sample Air Dried Wt. + tare wt. (grams):				1.0"	0.0	100.0%
Weight of Total Sample Air Dried:				3/4"	0.0	100.0%
Weight of Air Dried Hydrometer Sample (g):				1/2"	0.0	100.0%
Total Sample Oven Dried:				3/8"	0.0	100.0%
Hydrometer Sample Oven Dried (W):				#4	0.4	99.9%
% Passing #10:				#10	3.1	98.8%
Correction Factor a (Table I):				#20	0.5	97.8%
				#40	1.2	96.4%
				#60	2.7	93.5%
				#100	5.7	87.4%
				#200	11.8	75.1%

Description of Sand & Gravel Particles ☐ Rounded ☒ Angular ☒ Hard & Durable ☒ Soft ☐ Weathered & Friable ☐

Stirring Apparatus: A ☒ B ☐ Dispersion Time: 1 min. Sodium Hexametaphosphate: 40 g./ Liter

Balance: ID No. 3222 Cal. Date: 6/25/2012 Hydrometer: ID No. 3901 Cal. Date: 3/25/2012

Time	Temp. (0.5 °C)	Hydrometer		Corrections		Hydrometer		Percent Passing		Effective Depth	Table 3		Diameter
		Reading	Control	Cylinder	Composite	Control	Composite	P(=10) = (R x a / W) x 100	P' (total) = P x % Passing #10		L	K	
1	21.5	39.0	5.0	5.0		34.00		68.7%	67.9%	10.7	0.01320	0.04322	D = K x (L/T) ^{1/2}
2	21.5	37.0	5.0	5.0		32.00		64.7%	63.9%	11.0	0.01320	0.03103	
5	21.5	34.5	5.0	5.0		29.50		59.6%	59.0%	11.5	0.01320	0.01998	
15	21.5	31.0	5.0	5.0		26.00		52.6%	52.0%	12.0	0.01320	0.01182	
30	21.5	29.5	5.0	5.0		24.50		49.5%	49.0%	12.3	0.01320	0.00845	
60	21.5	28.0	5.0	5.0		23.00		46.5%	46.0%	12.5	0.01320	0.00603	
250	21.5	25.5	5.0	5.0		20.50		41.4%	41.0%	12.9	0.01320	0.00300	
1440	23.0	22.5	4.5	4.5		18.00		36.4%	36.0%	13.3	0.01297	0.00125	

References / Comments / Deviations ASTM D 422, D 2487, D 4318

Karen Warner
Technician NameNICET 117900
Certification #Kyle Baucom
Technical ResponsibilityProject Engineer
Position7/2/12
Date

Particle Size Analysis of Soils

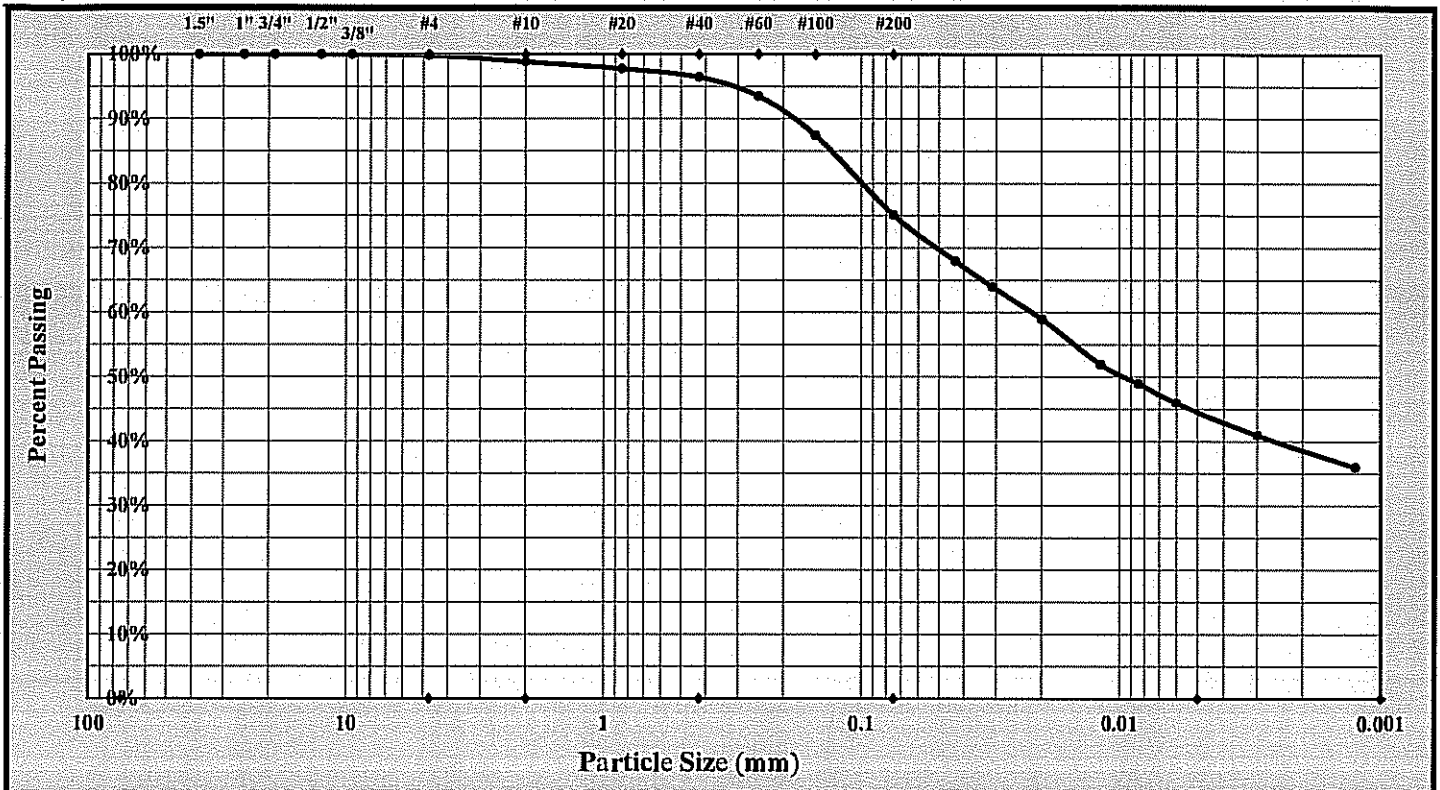


ASTM D422

Quality Assurance

S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273

S&ME Project #:	1356-11-032 Phase 03	Report Date:	6/27/12
Project Name:	Marshall Industrial Landfill No.1 - Cells 3 & 4	Test Date(s):	6/20-27/12
Client Name:	Duke Energy		
Address:	526 S. Church Street, Charlotte, NC 28202		
Boring #:	NA	Sample #:	CSL-1
		Sample Date:	6/19/12
Location:	Grid B3	Offset:	NA
		Elevation:	0-6'
Sample Description:	Orange Brown Clay w/Coarse to Fine Sand (CH)		



Cobbles	< 300 mm (12") and > 75 mm (3")	Fine Sand	< 0.425 mm and > 0.075 mm (#200)
Gravel	< 75 mm and > 4.75 mm (#4)	Silt	< 0.075 and > 0.005 mm
Coarse Sand	< 4.75 mm and > 2.00 mm (#10)	Clay	< 0.005 mm
Medium Sand	< 2.00 mm and > 0.425 mm (#40)	Colloids	< 0.001 mm

Maximum Particle Size:	#4	Gravel:	0.1%	Silt	30.6%
Silt & Clay (% Passing #200):	75.1%	Total Sand:	24.7%	Clay	44.5%
Relative Density (Assumed)	2.700	Moisture Content		Colloids	
Liquid Limit	61	Plastic Limit	31	Plastic Index	30
Coarse Sand:	1.0%	Medium Sand:	2.4%	Fine Sand:	21.3%

Description of Sand and Gravel	Rounded <input type="checkbox"/>	Angular <input checked="" type="checkbox"/>	Hard & Durable <input checked="" type="checkbox"/>	Soft <input type="checkbox"/>	Weathered & Friable <input type="checkbox"/>
Mechanical Stirring Apparatus A	Dispersion Period:	1 min.	Dispersing Agent:	Sodium Hexametaphosphate:	40 g./ Liter

References / Comments / Deviations: ASTM D 4318, D 854, D 2487

Technician Name: Chad Warner Date: 6/27/12

Kyle Baucom
Technical Responsibility

[Signature]
Signature

Project Engineer
Position

7/2/12
Date

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Moisture - Density Relationship



ASTM D558, D698, D1557, AASHTO T99, T180

Quality Assurance

S&ME, Inc.~ 9751 Southern Pine Boulevard~Charlotte, NC 28273

Project #:	1356-11-032	Phase 03	Report Date:	6/27/12
Project Name:	Marshall Industrial Landfill No. 1 - Cells 3 & 4		Test Date(s)	6/25-27/12
Client Name:	Duke Energy			
Client Address:	526 South Church Street, Charlotte, NC 28202			
Boring #:	NI	Sample #:	CSL-1	Sample Date:
Location:	Grid B3	Offset:	NI	Depth:
Sample Description:	Orange Brown Clay w/Coarse to Fine Sand (CH)			
Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #
Balance (0.1 g)	22182	6/8/2012	Compaction Mold	20231
Balance	22182	6/8/2012	Compaction Hammer	20222
Straightedge	20124	1/17/2012	Oven	10844
Sieve	22100	4/3/2012		
Water Content				
Water Content requires GP 2 Balance (0.1 gram Readability).				
Check:				
ASTM D2216 <input checked="" type="checkbox"/>	AASHTO T265 <input type="checkbox"/>	ASTM D4959 <input type="checkbox"/>	ASTM D4643 <input type="checkbox"/>	
Water Added:	540	600	660	480
Tare #:	MAC	SR	18	JDM
A. Tare Weight	A.	161.8	163.7	157.4
B. Wet Wt + Tare Wt	B.	1188.5	1169.4	1177.8
C. Dry Wt. + Tare Wt.	C.	976.5	947.7	939.4
D. Water Weight	B-C	212.0	221.7	238.4
E. Dry Weight	C-A	814.7	784.0	782.0
F. Moisture Content	100*D/E	26.0%	28.3%	30.5%
Compaction Data				
Requires a GP 5 Balance for ASTM (1 gram or .0022 Lb. readability).				
Check:				
ASTM D558 <input type="checkbox"/>	ASTM D 698 <input checked="" type="checkbox"/>	ASTM D1557 <input type="checkbox"/>	AASHTO T99 <input type="checkbox"/>	AASHTO T180 <input type="checkbox"/>
Method A <input checked="" type="checkbox"/>	Method B <input type="checkbox"/>	Method C <input type="checkbox"/>	Method D (ASTM 1978) <input type="checkbox"/>	AASHTO Method D <input type="checkbox"/>
G. Wt of Soil + Mold	G.	5975	5997	5997
H. Wt. of Mold	H.	4241	4241	4241
I. Wt. of Soil (g. or lbs.)	G-H	1734	1756	1756
J. Wt of Soil (Lbs.)	1/453.6 or 1	3.823	3.871	3.871
K. Mold Volume Factor	K.	30.09	30.09	30.09
L. Wet Density (PCF)	J*K	115.0	116.5	116.5
M. Dry Density (PCF)	L/(1+F)	91.3	90.8	89.3
Sieve Size used to separate the Oversize Fraction:				
#4 Sieve <input checked="" type="checkbox"/>				
3/8 inch Sieve <input type="checkbox"/>				
3/4 inch Sieve <input type="checkbox"/>				
Mechanical Rammer <input checked="" type="checkbox"/>				
Manual Rammer <input type="checkbox"/>				
Moist Preparation <input type="checkbox"/>				
Dry Preparation <input checked="" type="checkbox"/>				

References / Comments / Deviations: NI = Information not provided. NO = Not determined.

Jennifer Olsen
Technician Name

Signature
NICET / 117926
Certification Type/No.6/27/2012
DateKyle Baucom
Technical Responsibility

Signature
Project Engineer
Position7/2/12
Date

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Moisture - Density Report



Quality Assurance

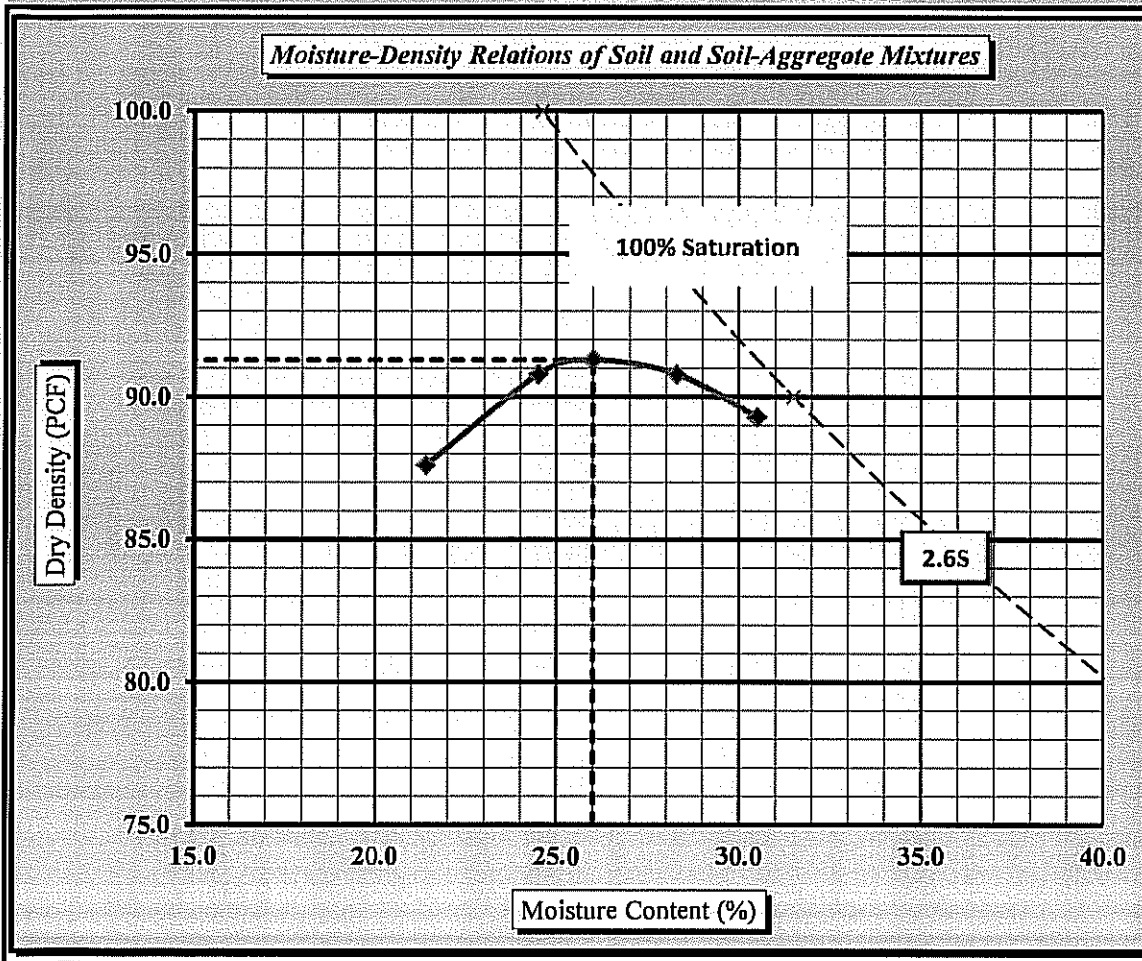
S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273

S&ME Project #:	1356-11-032	Phase 03	Report Date:	6/27/12	
Project Name:	Marshall Industrial Landfill No. 1 - Cells 3 & 4		Test Date(s):	6/25-27/12	
Client Name:	Duke Energy				
Client Address:	526 South Church Street, Charlotte, NC 28202				
Boring #:	NI	Sample #:	CSL-I	Sample Date:	6/16/2012
Location:	Grid B3	Offset:	NI	Depth:	0-6'
Sample Description:	Orange Brown Clay w/Coarse to Fine Sand (CH)				

Maximum Dry Density 91.3 PCF.

Optimum Moisture Content 26.0%

ASTM D 698 -- Method A



Soil Properties

Natural
Moisture Content NDSpecific
Gravity of
Soil (D854) ND

Liquid Limit 61

Plastic Limit 31

Plastic Index 30

% Passing

3/4"	100.0%
3/8"	100.0%
#4	99.9%
#10	98.8%
#40	96.4%
#60	93.5%
#200	75.1%

Oversize Fraction

Bulk Gravity

% Moisture

% Oversize

MDD

Opt. MC

Moisture-Density Curve Displayed: Fine Fraction ☒ Corrected for Oversize Fraction (ASTM D 4718) ☐

Sieve Size used to separate the Oversize Fraction: #4 Sieve ☒ 3/8 inch Sieve ☐ 3/4 inch Sieve ☐

Mechanical Rammer ☒ Manual Rammer ☐ Moist Preparation ☐ Dry Preparation ☒

References / Comments / Deviations: NI = Information not provided. ND = Not determined.

Technician Name: Jennifer Olsen *Jennifer Olsen*

Date: 6/27/12

Kyle Baucom
Technical Responsibility

Kyle Baucom
Signature

Project Engineer
Position

7/2/12
Date

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CONSTANT HEAD PERMEABILITY

ASTM D5084

S&ME Project Number: 1356-11-032 Phase 03	Project Name: Marshall Industrial Landfill No. 1 - Cells 3 & 4
---	--

S&ME Project Number: 1356-11-032 Phase 03	Project Name: Marshall Industrial Landfill No. 1 - Cells 3 & 4
---	--

Sample Name: CSL-2

Sample Description: Red Tan Orange Medium to Fine Sandy Clay (CH)

Type of Sample: Remolded

Sample Data		Molding Moisture Content		Target Molding Conditon		Additional Data	
Diam. (cm)	7.267	Tare No.	POT	γ_{wet} (pcf)	114.2	Panel No	22218
Leng. (cm)	7.767	WWS+ Tare (gm)	413.09	γ_{dry} (pcf)	91	Cell P (psi)	72.5
Area (cm ²)	41.48	WDS+Tare (gm)	353.39	w (%)	25.5	Influent P (psi)	70.6
Vol. (cm ³)	322.15	WT of Water (gm)	59.7	Actual Molding Condition		Effluent P (psi)	70.0
WWS (gm)	581.7	WT of TARE (gm)	113.27	γ_{wet} (pcf)	112.7		
		WT Dry Soil (gm)	240.12	γ_{dry} (pcf)	90.2	Gradient	5.0
		w (%)	24.9	w (%)	24.9		

$$K = (Q \times L) / (t \times H \times A)$$

[illegible]

Particle Size Analysis of Soils

ASTM D 422



S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273

Project #: 1356-11-032 Phase 03

Report Date: 8/10/12

Project Name: Marshall Industrial Landfill No.1 - Cells 3&4 Test Date(s): 7/26-8/10/12

Client Name: Duke Energy Address: 526 South Church Street, Charlotte, NC 28202

Boring #: NA Sample #: CSL-2 Sample Date: 7/19/12 Sieve 3.0" Retained Wt. 0.0

Location: *See Below Offset: NA Elevation: NA Sample # 1.5" 0.0

Sample Description: Red Tan Orange Medium to Fine Sandy Clay (CH) 1.0" 0.0

Pan #: Beaker #: Apparent Relative Density (Assumed) 2.650 3/4" 0.0

Hydrometer Jar #: Moisture Content Hygroscopic Natural 1/2" 9.2

Pan Tare Weight (grams): 550.64 Tare # II ND 3/8" 10.6

Total Sample Air Dried Wt. + tare wt. (grams): 550.64 A Tare Wt. 16.89 #4 17.9

Weight of Total Sample Air Dried: 50.50 B Wet Wt. + A 28.32 #10 22.98

Weight of Air Dried Hydrometer Sample (g): 543.72 C Dry Wt. + A 28.17 #20 0.73

Total Sample Oven Dried: 49.84 D Water Wt. (B-C) 0.15 #40 1.90

Hydrometer Sample Oven Dried (W): 95.8% E Dry Wt. (C-A) 11.28 #60 4.44

% Passing #10: 1.00 % Moisture (100 x D/E) 1.33% #100 8.62

Correction Factor a (Table I): 1.00 % Moisture (100 x D/E) 1.33% #200 16.30

Description of Sand & Gravel Particles Rounded ☐ Angular ☐ Hard & Durable ☐ Soft ☐ Weathered & Friable ☐Stirring Apparatus: A ☒ B ☐ Dispersion Time: 1 min. Sodium Hexametaphosphate: 40 g/Liter

Balance: ID No. 3222 Cal. Date: 6/25/2012 Hydrometer: ID No. 3901 Cal. Date: 3/25/2012

Control Cylinder ☒ Composite Correction ☐ Type: 151H ☐ 152H ☒

Time	Temp.	Hydrometer	Control	Composite	Hydrometer	P(#10) =	P (total) =	Effective	Table 3	Diameter
T (Min.)	(0.5 °C)	Reading	Cylinder	Correction	R	(R x a / W) x 100	P x % Passing #10	Depth	K	D = K x (L/T) ^{1/2}
1	21.5	36.0	5.0		31.00	62.2%	59.6%	11.2	0.01340	0.04487
2	21.5	33.5	5.0		28.50	57.2%	54.8%	11.6	0.01340	0.03230
5	21.5	31.0	5.0		26.00	52.2%	50.0%	12.0	0.01340	0.02079
15	21.5	28.0	5.0		23.00	46.2%	44.2%	12.5	0.01340	0.01224
30	21.5	26.0	5.0		21.00	42.1%	40.4%	12.9	0.01340	0.00877
60	21.5	24.0	5.0		19.00	38.1%	36.5%	13.2	0.01340	0.00628
250	21.5	22.0	5.0		17.00	34.1%	32.7%	13.5	0.01340	0.00311
1440	21.5	20.0	5.0		15.00	30.1%	28.8%	13.8	0.01340	0.00131

References / Comments / Deviations ASTM D 422, D 2487, D 4318

*Compacted Soil Liner Stockpile

Jennifer Olsen/Karen Warner

NICET 117900

Kyle Baucum

Project Engineer

8/15/12

Technician Name

Certification #

Technical Responsibility

Position

Date

Particle Size Analysis of Soils



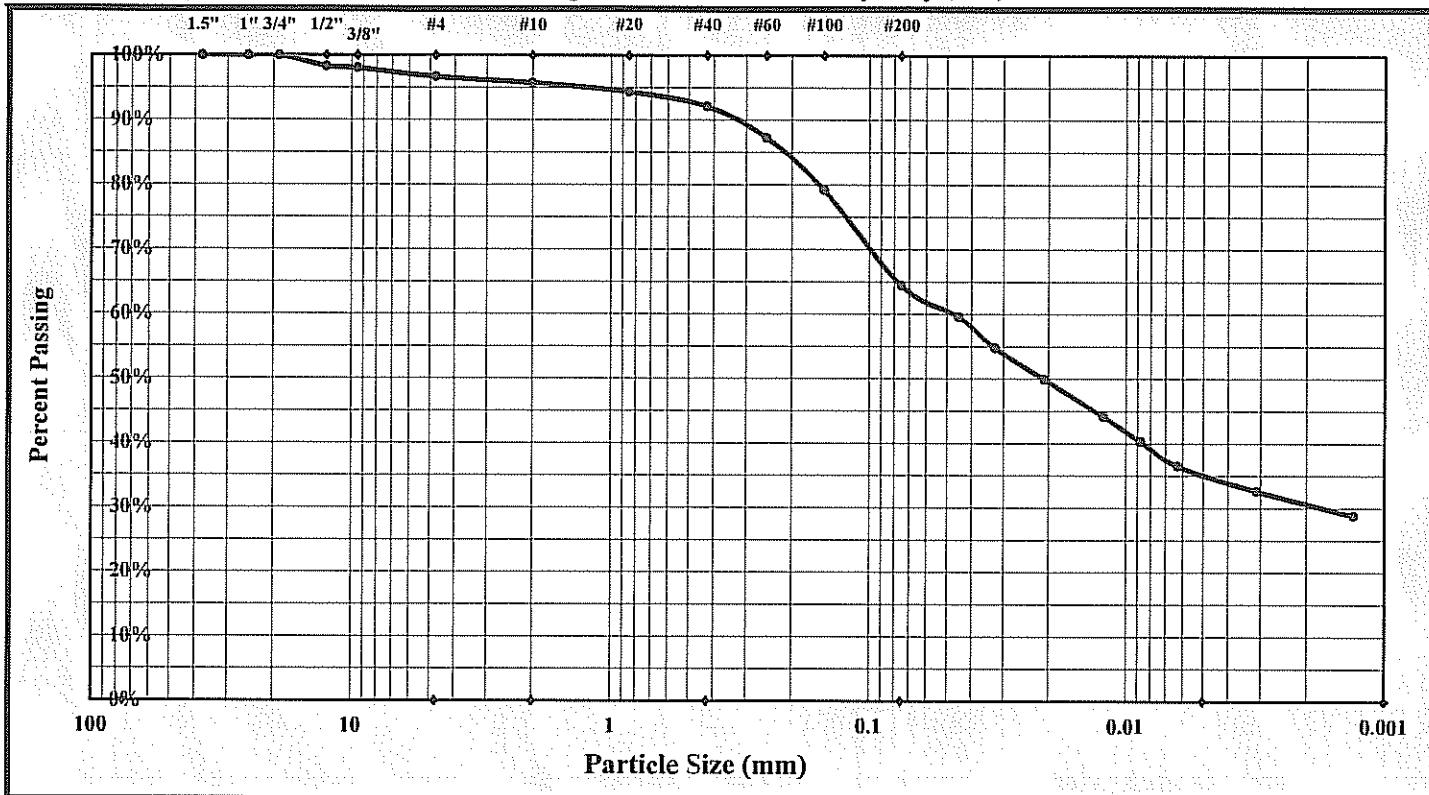
ASTM D422

Quality Assurance

S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273

S&ME Project #:	1356-11-032 Phase 03	Report Date:	8/10/12
Project Name:	Marshall Industrial Landfill No.1 - Cells 3&4	Test Date(s):	7/26-8/10/12
Client Name:	Duke Energy		
Address:	526 South Church Street, Charlotte, NC 28202		
Boring #:	NA	Sample #:	CSL-2
		Sample Date:	7/19/12
Location:	*See Below	Offset:	NA
		Elevation:	NA

Sample Description: Red Tan Orange Medium to Fine Sandy Clay (CH)



Cobbles	< 300 mm (12\") and > 75 mm (3\")	Fine Sand	< 0.425 mm and > 0.075 mm (#200)
Gravel	< 75 mm and > 4.75 mm (#4)	Silt	< 0.075 and > 0.005 mm
Coarse Sand	< 4.75 mm and > 2.00 mm (#10)	Clay	< 0.005 mm
Medium Sand	< 2.00 mm and > 0.425 mm (#40)	Colloids	< 0.001 mm

Maximum Particle Size:	1/2"	Gravel:	3.3%	Silt	29.4%
Silt & Clay (% Passing #200):	64.4%	Total Sand:	32.3%	Clay	35.0%
Moisture Content				Colloids	
Liquid Limit	52	Plastic Limit	28	Plastic Index	24
Coarse Sand:	0.9%	Medium Sand:	3.7%	Fine Sand:	27.7%

Description of Sand and Gravel	Rounded <input type="checkbox"/>	Angular <input type="checkbox"/>	Hard & Durable <input type="checkbox"/>	Soft <input type="checkbox"/>	Weathered & Friable <input type="checkbox"/>
Mechanical Stirring Apparatus A	Dispersion Period:	1 min.	Dispersing Agent:	Sodium Hexametaphosphate:	40 g./ Liter

References / Comments / Deviations: ASTM D 4318, D 854, D 2487

Technician Name: Kyle Baucom Date: 8/14/12

Kyle Baucom
Technical Responsibility

[Signature]
Signature

Project Engineer
Position

8/15/12
Date

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Liquid Limit, Plastic Limit, and Plastic Index



Another code

ASTM D 4318 ☒AASHTO T 89 ☐AASHTO T 90 ☐

Quality Assurance

S&ME, Inc. - 9751 Southern Pine Boulevard, Charlotte, NC 28273

Project #: 1356-11-032 Phase 03

Report Date: 8/14/12

Project Name: Marshall Industrial Landfill No.1- Cells 3&4

Test Date(s) 7/20-8/14/12

Client Name: Duke Energy

Client Address: 526 South Church Street, Charlotte, NC 28202

Boring #: NA

Sample #: CSL-2

Sample Date: 7/19/12

Location: *See Below

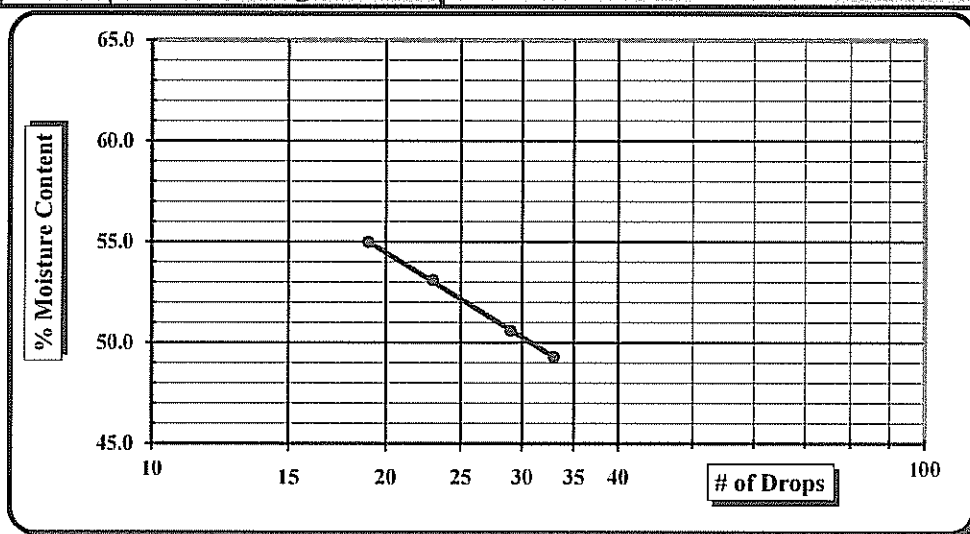
Offset: NA

Elevation: NA

Sample Description: Red Tan Orange Medium to Fine Sandy Clay (CH)

Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #	Cal Date:
Balance (0.01 g)	3222	6/25/2012	Grooving tool	20165	12/20/2012
LL Apparatus	20230	6/26/2012	Grooving tool		
Oven	10844	5/9/2012	Grooving tool		

Pan #	Tare #:	Liquid Limit						Plastic Limit		
		39	2	L-10	P-2			41	57	
A	Tare Weight	13.97	15.78	12.46	12.66			15.82	13.89	
B	Wet Soil Weight + A	23.15	24.14	21.66	20.61			22.36	21.53	
C	Dry Soil Weight + A	20.12	21.33	18.47	17.79			20.94	19.88	
D	Water Weight (B-C)	3.03	2.81	3.19	2.82			1.42	1.65	
E	Dry Soil Weight (C-A)	6.15	5.55	6.01	5.13			5.12	5.99	
F	% Moisture (D/E)*100	49.3%	50.6%	53.1%	55.0%			27.7%	27.5%	
N	# OF DROPS	33	29	23	19			Moisture Contents determined by ASTM D 2216		
LL	LL = F * FACTOR									
Ave.	Average							27.6%		



One Point Liquid Limit			
N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic ☒
 Liquid Limit 52
 Plastic Limit 28
 Plastic Index 24
 Group Symbol CH

Multipoint Method ☒
 One-point Method ☐

Wet Preparation ☐ Dry Preparation ☒ Air Dried ☒

Estimate the % Retained on the #40 Sieve:

Notes / Deviations / References:

*Compacted Soil Liner Stockpile

ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils

Karen Warner
Technician Name

8/14/12
Date

Kyle Baucom
Technical Responsibility

8/15/12
Date

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Moisture - Density Relationship



ASTM D558, D698, D1557, AASHTO T99, T180

Quality Assurance

S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273

Project #:	1356-11-032	Phase 03	Report Date:	8/14/12
Project Name:	Marshall Industrial Landfill No. 1 - Cells 3 & 4		Test Date(s)	7/26-28/12
Client Name:	Duke Energy			
Client Address:	526 South Church Street, Charlotte, NC 28202			
Boring #:	NI	Sample #:	CSL-2	Sample Date:
Location:	**See Comments Below	Offset:	NI	Depth:
Sample Description:	Red Tan Orange Medium to Fine Sandy Clay (CH)			

Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #	Cal Date:
Balance (0.1 g)	22182	6/8/2011	Compaction Mold	20231	1/6/2012
Balance	22182	6/8/2011	Compaction Hammer	20222	6/6/2011
Straightedge	20124	1/17/2012	Oven	10844	5/9/2012
Sieve #4	10939	4/3/2012			

Water Content		Water Content requires GP 2 Balance (0.1 gram Readability).				Check:	
ASTM D2216 <input checked="" type="checkbox"/>		AASHTO T265 <input type="checkbox"/>		ASTM D4959 <input type="checkbox"/>		ASTM D4643 <input type="checkbox"/>	
Water Added:		180	120	60	As Is	240	
Tare #:		PMB	SQ-1	691	JRC	G	
A. Tare Weight	A.	162.3	159.1	156.3	156.2	157.2	
B. Wet Wt + Tare Wt	B.	1140.3	1159.7	1203.0	1078.5	1048.8	
C. Dry Wt. + Tare Wt.	C.	935.4	965.6	1018.8	932.7	847.5	
D. Water Weight	B-C	204.9	194.1	184.2	145.8	201.3	
E. Dry Weight	C-A	773.1	806.5	862.5	776.5	690.3	
F. Moisture Content	100*D/E	26.5%	24.1%	21.4%	18.8%	29.2%	

Compaction Data		Requires a GP 5 Balance for ASTM (1 gram or .0022 Lb. readability).				Check:	
ASTM D558 <input type="checkbox"/>		ASTM D 698 <input checked="" type="checkbox"/>		ASTM D1557 <input type="checkbox"/>		AASHTO T99 <input type="checkbox"/>	
Method A <input checked="" type="checkbox"/>		Method B <input type="checkbox"/>		Method C <input type="checkbox"/>		Method D (ASTM 1978) <input type="checkbox"/>	
						AASHTO T180 <input type="checkbox"/>	
						AASHTO Method D <input type="checkbox"/>	
G. Wt of Soil + Mold	G.	6044	6034	5979	5876	6013	
H. Wt. of Mold	H.	4241	4241	4241	4241	4241	
I. Wt. of Soil (g. or lbs.)	G-H	1803	1793	1738	1635	1772	
J. Wt of Soil (Lbs.)	I/453.6 or I	3.975	3.953	3.832	3.604	3.907	
K. Mold Volume Factor	K.	30.09	30.09	30.09	30.09	30.09	
L. Wet Density (PCF)	J*K	119.6	118.9	115.3	108.4	117.6	
M. Dry Density (PCF)	L/(1+F)	94.5	95.8	95.0	91.2	91.0	
Sieve Size used to separate the Oversize Fraction: #4 Sieve <input checked="" type="checkbox"/> 3/8 inch Sieve <input type="checkbox"/> 3/4 inch Sieve <input type="checkbox"/>							
Mechanical Rammer <input checked="" type="checkbox"/> Manual Rammer <input type="checkbox"/> Moist Preparation <input type="checkbox"/> Dry Preparation <input checked="" type="checkbox"/>							

References / Comments / Deviations: *ND = Not determined *NI = Information was not provided

**Sample Location: Compacted Soil Liner Stockpile

Jennifer Olsen
Technician Name

Jennifer Olsen
Signature

NICET/117926
Certification Type/No.

7/28/2012
Date

Kyle Baucom
Technical Responsibility

Kyle Baucom
Signature

Project Engineer
Position

8/15/12
Date

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Moisture - Density Report



Quality Assurance

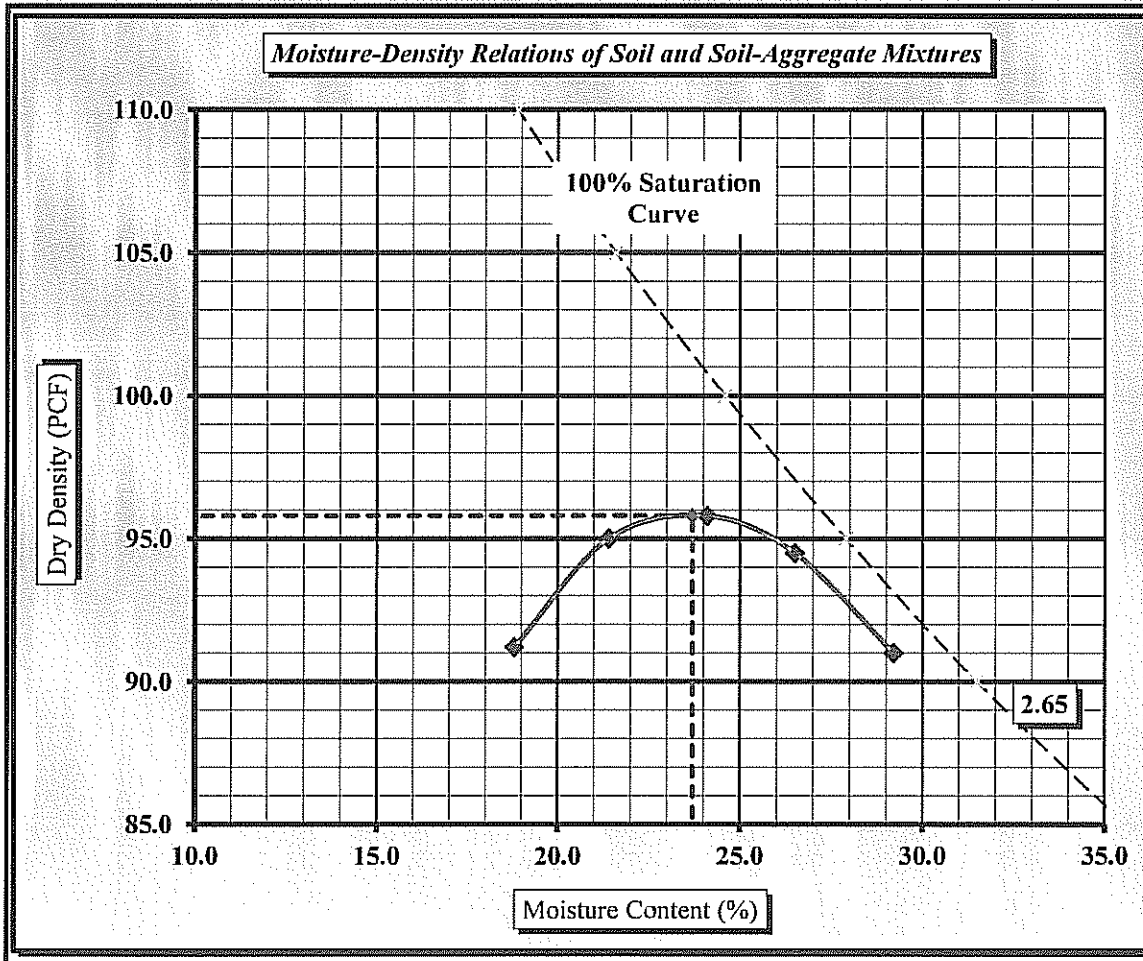
S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273

S&ME Project #:	1356-11-032	Phase 03	Report Date:	8/14/12	
Project Name:	Marshall Industrial Landfill No. 1 - Cells 3 & 4		Test Date(s):	7/26-28/12	
Client Name:	Duke Energy				
Client Address:	526 South Church Street, Charlotte, NC 28202				
Boring #:	NI	Sample #:	CSL-2	Sample Date:	7/19/2012
Location:	**See Comments Below	Offset:	NI	Depth:	NI
Sample Description:	Red Tan Orange Medium to Fine Sandy Clay (CH)				

Maximum Dry Density 95.8 PCF.

Optimum Moisture Content 23.7%

ASTM D 698 -- Method A



Soil Properties

Natural Moisture Content	ND
Specific Gravity of Soil (D854)	ND
Liquid Limit	52
Plastic Limit	28
Plastic Index	24

% Passing

3/4"	100.0%
3/8"	98.0%
#4	96.7%
#10	95.8%
#20	94.4%
#40	92.1%
#200	64.4%

Oversize Fraction

Bulk Gravity
% Moisture
% Oversize
MDD
Opt. MC

Moisture-Density Curve Displayed:	Fine Fraction <input checked="" type="checkbox"/>	Corrected for Oversize Fraction (ASTM D 4718) <input type="checkbox"/>
Sieve Size used to separate the Oversize Fraction:	#4 Sieve <input checked="" type="checkbox"/>	3/8 inch Sieve <input type="checkbox"/> 3/4 inch Sieve <input type="checkbox"/>
Mechanical Rammer <input checked="" type="checkbox"/>	Manual Rammer <input type="checkbox"/>	Moist Preparation <input type="checkbox"/> Dry Preparation <input checked="" type="checkbox"/>

References / Comments / Deviations: *ND = Not determined *NI = Information was not provided

**Sample Location: Compacted Soil Liner Stockpile

ASTM D 2216: Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass

ASTM D 698: Laboratory Compaction Characteristics of Soil Using Standard Effort

Kyle Baucom

Technical Responsibility

Signature

Project Engineer
Position

8/15/12
Date

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APPENDIX I – EARTHWORKS

Section 3 – Topsoil/Vegetative Soil Cover

Final Soil Cover As-Built Drawing
Soil Cover Thickness Verification

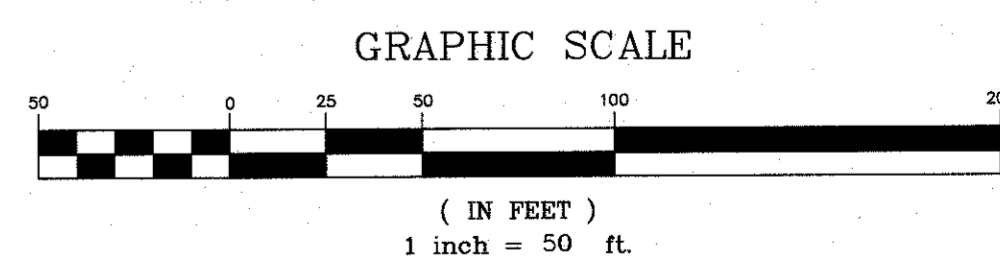
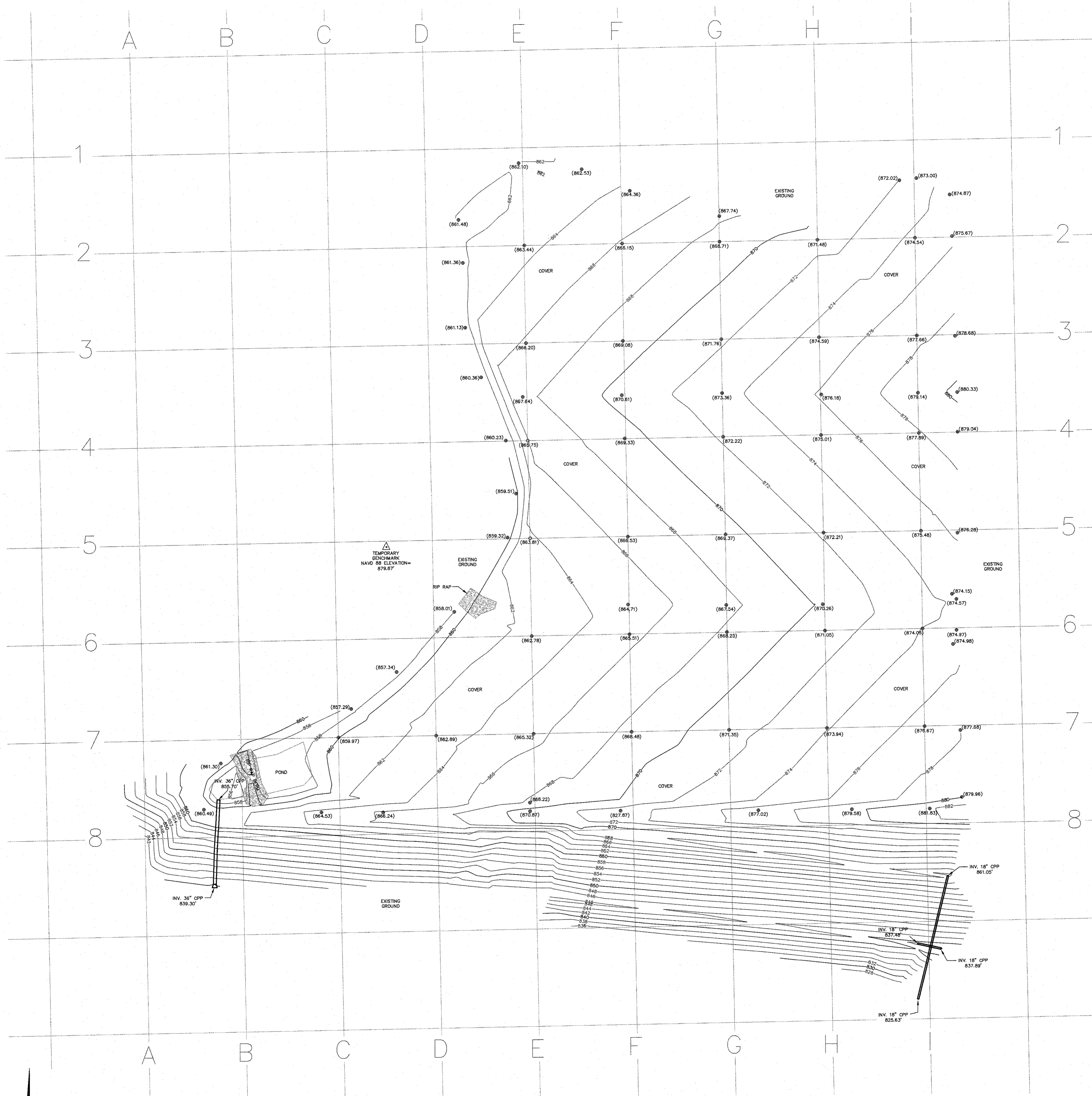
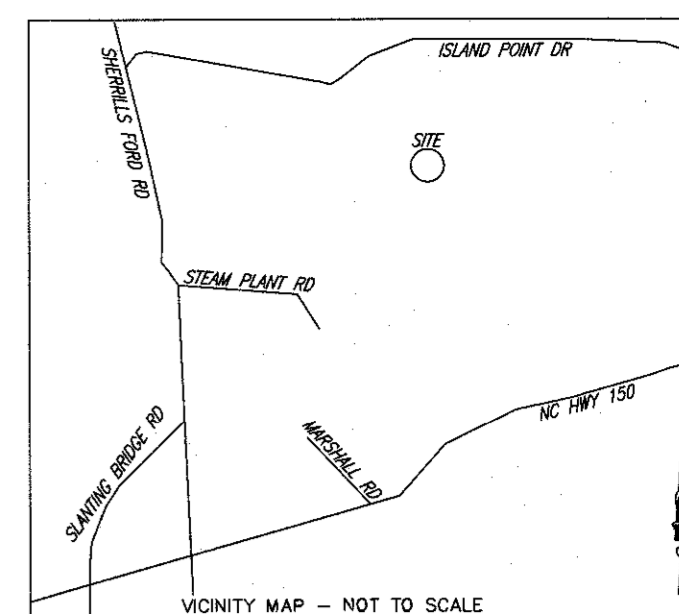
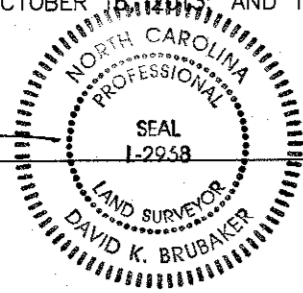


Final Soil Cover As-Built Drawing



DAVID K. BRUBAKER, P.L.S. # 2968

DATE 10/22/2013



GENERAL NOTES:

1. ALL DIMENSIONS SHOWN ARE IN US SURVEY FEET AND ARE HORIZONTAL GROUND DISTANCES UNLESS OTHERWISE INDICATED. AREA BY COORDINATE METHOD.
2. PROPERTY SUBJECT TO ALL EASEMENTS AND RESTRICTIONS OF RECORD.
3. ELEVATIONS ARE BASED ON NAVD88.
4. NO FIELD WORK OR RESEARCH WAS PERFORMED TO DETERMINE OR VERIFY ANY BOUNDARY LINES.
5. THIS SURVEY IS FOR TOPOGRAPHIC PURPOSES AND IS NOT INTENDED TO BE A BOUNDARY SURVEY OF THE ENTIRE TRACT.
6. THIS SURVEY IS OF AN EXISTING PARCEL OF LAND.

LEGEND
CPP = CORRUGATED PLASTIC PIPE
INV. = INVERT
⊕ (866.50) = SPOT ELEVATION

TOPOGRAPHIC SURVEY - INTERMEDIATE COVER
OF
CELLS 3 & 4
MARSHALL STEAM STATION
MOUNTAIN CREEK TOWNSHIP, CATAWBA COUNTY, N.C.

PREPARED FOR: S&ME, INC 9751 SOUTHERN PINE BOULEVARD CHARLOTTE, NC 28273 PHONE: 704.523.4726 FAX: 704.525.3953	OWNER: DUKE ENERGY CAROLINAS, LLC PO BOX 1007 CHARLOTTE, NC 28201
--	--



128 Talbert Road Suite A • Mooresville, NC 28117 • 704.662.0100

NO LICENSE NO. 5 000

Parcel ID Partion of 461803426350	Drawn By DE	Date of Survey OCTOBER 3, 2013	Field Book NA	Job Number 13-70019.000
Sheet Number 1 OF 1	Checked By DKR	Date OCTOBER 16, 2013	Scale 1" = 50'	File Name MARSHALL_CELL_3-4

Soil Cover Thickness Verification





Marshall Cells 3 &4

STATION	TOP OF ASH	TOP OF COVER	DIFFERENCE
C-7	858.31	859.97	1.66
D-7	861.25	862.89	1.64
E-2	861.83	863.44	1.61
E-3	864.65	866.20	1.55
E-4	863.82	865.75	1.93
E-5	862.24	863.81	1.57
E-6	861.21	862.78	1.57
E-7	863.48	865.32	1.84
F-2	864.44	866.15	1.71
F-3	867.48	869.08	1.60
F-4	867.72	869.33	1.61
F-5	864.97	866.53	1.56
F-6	863.99	865.51	1.52
F-7	866.91	868.48	1.57
G-2	867.11	868.71	1.60
G-3	870.19	871.76	1.57
G-4	870.65	872.22	1.57
G-5	867.85	869.37	1.52
G-6	866.67	868.25	1.58
G-7	869.61	871.35	1.74
H-2	869.18	871.48	2.30
H-3	872.85	874.59	1.74
H-4	873.49	875.01	1.52
H-5	870.69	872.21	1.52
H-6	869.54	871.05	1.51
H-7	872.37	873.94	1.57
I-2	872.84	874.54	1.70
I-3	875.97	877.66	1.69
I-4	876.29	877.89	1.60
I-5	873.58	875.48	1.90
I-6	872.39	874.05	1.66
I-7	875.15	876.67	1.52



APPENDIX II – PROJECT DOCUMENTATION

Section 1 – Construction Photographs

Section 2 – Field Reports

Section 3 – Issued for Construction Drawings

Section 4 – Issued for Construction Specifications


**APPENDIX II – PROJECT
DOCUMENTATION**
Section 1 – Construction Photographs



		Date: 07/19/12
		Photographer: Jimmy Addis
1	Location / Orientation	South end of Cells 3 and 4 footprint facing north
	Remarks	Subgrade fill progressing to the north

		Date: 02/27/13
		Photographer: Kyle Baucom
2	Location / Orientation	Entrance ramp of Cells 3 and 4 footprint facing east
	Remarks	Subgrade fill operations progressing; S&ME technician on-site performing density tests

		Date: 08/27/13
		Photographer: Darrell Wolfe
3	Location / Orientation	South end of Cells 3 and 4 footprint facing northeast
	Remarks	Placement of 2 nd 6-inch lift of structural fill cover soil

		Date: 09/13/13
		Photographer: Darrell Wolfe
4	Location / Orientation	South end of Cells 3 and 4 footprint facing northwest
	Remarks	Structural fill closure seeded and strawed

**APPENDIX II – PROJECT
DOCUMENTATION**
Section 2 – Field Reports





9751 Southern Pine Blvd
Charlotte, NC 28273
(704) 523-4726
(704) 525-3953 fax

Field Report

Date May 3, 2012	Job No. 1356-11-032-03
Project/Location MSS Ind. LF#1 Cells 3 & 4	
Contractor Southland/SEFA	Weather/Temp Sunny/80's
Present at Site Ronnie Puckett - SEFA Jason Mayhew - Southland	
Time 5.0	Mileage 80.0

Services Performed	
<input type="checkbox"/> Concrete Testing	<input type="checkbox"/> Asphalt Coring
<input type="checkbox"/> Cylinder Pickup	<input type="checkbox"/> Concrete Coring
<input type="checkbox"/> Asphalt Testing	<input type="checkbox"/> Undercut Evaluation
<input type="checkbox"/> Steel Testing	<input type="checkbox"/> Foundation Evaluation
	<input type="checkbox"/> Proofrolling
	<input checked="" type="checkbox"/> In-Place Density
<input type="checkbox"/> Other (Explain)	

To: File

Observations/Remarks:

S&ME rep. traveled to site arrived at 10:30 am. Observed SEFA placing bottom ash on the future haul road, that has been widened out to approximately 50 feet now. Contractor has placed a small area of structural fill (flyash) on the south end of future cell 4. Not a big enough area to test yet. I spoke w/ Ronnie who informed me that the haul road should be completed w/in the next few days, and then they would start concentrating on flooring in available areas of cells 3 and 4. Clearing and burning in progress. Spoke w/ Jason, said he should be done w/ clearing by early next week. I informed him that S&ME would like to schedule test pits for sometime next week. Told Jason that Kyle Bacon would contact him about setting up a time to do the TP's. I took some pictures of existing conditions, left site @ 12:15.

On-Site Representative/Company

Jimmy Abbia
S&ME Personnel

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FIELD REPORT

Date:

May 21, 2012

Job No.:

1356-11-032-Ph. 03

Project/Location:

MSS Ind. LF #1-Cells 3&4

Contractor:

SEFA/Southland

Weather/Temperature:

Mostly sunny/70's

Present at Site:

Ronnie Puckett

Time:

6.0

Mileage:

80.0

Services Performed

- | | |
|---|--|
| <input type="checkbox"/> Concrete Testing | <input type="checkbox"/> Asphalt Coring |
| <input type="checkbox"/> Cylinder Pickup | <input type="checkbox"/> Concrete Coring |
| <input type="checkbox"/> Asphalt Testing | <input type="checkbox"/> Undercut Evaluation |
| <input type="checkbox"/> Steel Testing | <input type="checkbox"/> Foundation Evaluation |
| | <input type="checkbox"/> Proofrolling |
| | <input checked="" type="checkbox"/> In-Place Density |

☐ Other (Explain)

To: File

Observations/Remarks:

Technician onsite at 10:15 am. Observe SEFA placing structural fill (flyash) in future cell 4. Contractor utilizing a CAT D6 XLT dozer to spread flyash in approximately a one foot thick lift. Contractor running two 40 ton articulate dump trucks and Charrah hauling in with one tri-axle dump truck. Spoke with dozer operator (Alberto) informed him to keep lifts at a foot or less and do not cover any ash that has not been wet in place. The material Charrah is hauling is very dry. Contractor is using their 25 ton articulate water truck for compaction, also spoke with the operator and asked if he was able to keep up with the structural fill wetting in place and maintain haul roads. He said it was a lot to keep up with, but they have another smaller water truck to maintain haul roads when operators are available to run. I told him I would talk with Jerry if this becomes an issue, with the weather turning warmer in the coming months. I performed three field density test (shelby tube method). All test exceed required compaction and were within the moisture criteria. refer to attached data sheet. Informed contractor of test results. Southland started stripping topsoil on the North side of clearing area this am. Had to move some equipment this pm, no stripping done while I was still onsite. I left jobsite at 2:30 pm.

Jimmy Addis

On-Site Representative/Company

S&ME Personnel

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Charlotte, NC 28273
(704) 523-4726
(704) 525-3953 fax

FIELD REPORT

Date:

May 23, 2012

Job No.:

1356-11-032-03

Project/Location:

MSS Ind. LF #1-Cells 3 & 4

Contractor:

SEFA/Southland

Weather/Temperature:

Partly Cloudy/80's

Present at Site:

Ronnie Puckett

Jerry Combs

Time:

8.0

Mileage:

80.0

Services Performed

- | | |
|---|--|
| <input type="checkbox"/> Concrete Testing | <input type="checkbox"/> Asphalt Coring |
| <input type="checkbox"/> Cylinder Pickup | <input type="checkbox"/> Concrete Coring |
| <input type="checkbox"/> Asphalt Testing | <input type="checkbox"/> Undercut Evaluation |
| <input type="checkbox"/> Steel Testing | <input type="checkbox"/> Foundation Evaluation |
| | <input type="checkbox"/> Proofrolling |
| | <input checked="" type="checkbox"/> In-Place Density |

☐ Other (Explain)

To: File

Observations/Remarks:

S&ME technician onsite at 11:15 am. Observe subgrade prep by SEFA, flyash being placed in future cell 4. Contractor utilizing a 750 John Deere dozer to place flyash. Lift thickness is approximately 1 foot. Contractor has 2, 40 ton offroad dump trucks hauling in today. A 25 ton offroad water truck was wetting the flyash when I arrived and also rolling in the ash for compactive effort. I performed three field density test (shelby tube method) on inplace flyash. One of these test (#9) failed on moisture and compaction requirements. Informed Ronnie of test results and that failing material was the bottom fines that Charrah has been hauling in. I request that SEFA rework failing area for retest. Area was reworked and retest performed which passed. Refer to attached data sheet for test information. I told Ronnie I would mention to Kyle about the fines being used. Spoke with SEFA's dozer operator (Alberto) recommend that he spread these fines thinner. Other activity onsite today: Southland has 2 scrapers (Fiatallis) stripping in the area of test pits 7,8 & 10. This material is being hauled and stockpiled in the NE corner of cell 1. These areas appear to be cleaning up pretty good w/out stripping off a foot deep. I suggest to Ronnie to use his best judgement for strip depth (ie; don't waste good dirt), and relate this to the other operators. I left site @ 4:30 and returned to the office.

Jimmy Addis

On-Site Representative/Company

S&ME Personnel

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FIELD REPORT

Date:

May 29, 2012

Job No.:

1356-11-032-03

Project/Location:

MSS Ind. LF # 1-Cells 3&4

Contractor:

SEFA/Southland

Weather/Temperature:

Cloudy- rain showers/80's

Present at Site:

Jason Mayhew

Ronnie Puckett

Time:

6.0

Mileage:

80.0

Services Performed

- | | |
|---|--|
| <input type="checkbox"/> Concrete Testing | <input type="checkbox"/> Asphalt Coring |
| <input type="checkbox"/> Cylinder Pickup | <input type="checkbox"/> Concrete Coring |
| <input type="checkbox"/> Asphalt Testing | <input type="checkbox"/> Undercut Evaluation |
| <input type="checkbox"/> Steel Testing | <input type="checkbox"/> Foundation Evaluation |
| | <input type="checkbox"/> Proofrolling |
| | <input checked="" type="checkbox"/> In-Place Density |

☐ Other (Explain)

To: File

Observations/Remarks:

S&ME technician onsite at 10 am. Talk with Jason about job progress, was in the process of stripping on the North side of clearing area approximately between test pits 1 and 9. Southland is utilizing two Fiatallis scrapers and a CAT D6 dozer to strip. Strippings continue to be hauled and stockpiled in the NE corner of existing cell 1. Jason said he hopes to complete stripping this week. Jason to have stripping stockpile surveyed, hopefully next week.

Observe SEFA placing structural fill with/in future cell 4 area. SEFA utilizing a CAT D6XLT dozer to spread flyash. Observed lift thickness on the order of one foot being placed east to west. SEFA had two 40 ton offroad trucks hauling out of the silos today. Charrah also hauling in bottom fines from stockpile with one tri-axle dump truck. SEFA using their 25 ton water truck to wet and compact flyash. Rain showers slowed construction activity today. I was able to perform three field density test today on inplace flyash. All test passed required compaction and moisture criteria, refer to attached data sheet. Informed Ronnie of test results. Technician left site at 2pm.

Jimmy Addis

On-Site Representative/Company

S&ME Personnel

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Charlotte, NC 28273
(704) 523-4726
(704) 525-3953 fax

Field Report

Date June 1, 2012	Job No. 1356-11-032-03
Project/Location MSS Ind. LF #1 Cells 3 & 4	
Contractor SEFA/Southland	Weather/Temp Mostly cloudy/81°
Present at Site Ronnie Puckett	
Time 7.0	Mileage 80.0

Services Performed	
<input type="checkbox"/> Concrete Testing	<input type="checkbox"/> Asphalt Coring
<input type="checkbox"/> Cylinder Pickup	<input type="checkbox"/> Concrete Coring
<input type="checkbox"/> Asphalt Testing	<input type="checkbox"/> Undercut Evaluation
<input type="checkbox"/> Steel Testing	<input type="checkbox"/> Foundation Evaluation
	<input type="checkbox"/> Proofrolling
	<input checked="" type="checkbox"/> In-Place Density
<input type="checkbox"/> Other (Explain)	

To: File

Observations/Remarks:

S&ME technician onsite at 10:30 am. Observe SEFA placing structural fill (flyash) in future cell 4. SEFA using a CAT D6XL dozer to spread flyash in one foot thick lifts. Today SEFA had two 40ton offroad trucks hauling fill in. Charrah continues to run one tri-axle dump truck into cell 4 w/ bottom fines. SEFA utilizing their 25ton offroad water truck to wet/maintain and compact fill material. I performed four field density test (fdt) today. All test exceed required compaction, and were w/in the moisture criteria. Refer to attached fdt data sheet. Informed Ronnie of test results.

Southland continues to strip cleared area on North side. Strippings being stockpiled in existing Cell 1 ~ NE corner. Technician left site @ 2:35 pm.

On-Site Representative/Company

S&ME Personnel

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Field Report

Date	Job No.
June 4, 2012	1356-11-032-03
Project/Location	
MSS Ind. LF#1-Cells 3 & 4	
Contractor	Weather/Temp
SEFA/Southland	Cloudy / 80's
Present at Site	
Ronnie Puckett	
Time	Mileage
3.5	80.0

Services Performed

- | | |
|---|--|
| <input type="checkbox"/> Concrete Testing | <input type="checkbox"/> Asphalt Coring |
| <input type="checkbox"/> Cylinder Pickup | <input type="checkbox"/> Concrete Coring |
| <input type="checkbox"/> Asphalt Testing | <input type="checkbox"/> Undercut Evaluation |
| <input type="checkbox"/> Steel Testing | <input type="checkbox"/> Foundation Evaluation |
| | <input type="checkbox"/> Proofrolling |
| | <input type="checkbox"/> In-Place Density |
| <input type="checkbox"/> Other (Explain) | |

To: File

Observations/Remarks:

Technician onsite at 12:30. SEFA placing structural fill (flyash) in future Cell 4 today. I did not run any field density test. Picked up proctor sample #2 ~ SG-2, and logged into soils lab. Southland continues to strip on North side "hallow" w/ two scrapers, hauled to Cell 1 ~ NE corner and stockpiled. Left site at 2:15 pm.

On-Site Representative/Company

Jimmy Addison

S&ME Personnel

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Field Report

Date June 7, 2012	Job No. 1356-11-032-03
Project/Location MSS Ind, LF #1-Cells 3 & 4	
Contractor Southland	Weather/Temp PC/80's
Present at Site Ronnie Puckett Brad Mayhew	
Time 8.0	Mileage 80.0

Services Performed

- | | |
|---|---|
| <input type="checkbox"/> Concrete Testing | <input type="checkbox"/> Asphalt Coring |
| <input type="checkbox"/> Cylinder Pickup | <input type="checkbox"/> Concrete Coring |
| <input type="checkbox"/> Asphalt Testing | <input type="checkbox"/> Undercut Evolution |
| <input type="checkbox"/> Steel Testing | <input type="checkbox"/> Foundation Evolution |
| | <input type="checkbox"/> Proofrolling |
| | <input type="checkbox"/> In-Place Density |

☒ Other (Explain)

Clay liner excavation

to: File

Observations/Remarks:

Got a call from Jason Mayhew @ 8:30 am this morning. He said they wanted to start excavating clay material for the compacted soil liner (CSL). I spoke w/ Kyle Bancom before heading to jobsite. I got onsite around 9:30 am. Southland in process of excavating out CSL in vicinity of test pit #8. Contractor using a CAT 330D trackhoe and two tandem-axle dump trucks. CSL material being stockpiled at designated area south of Cells 3 & 4. Excavation depths on average of 4 to 6 feet today. 80 loads stockpiled today. Left site @ 4:15 pm.

On-Site Representative/Company

Jimmy Adams

S&ME Personnel

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Charlotte, NC 28273
(704) 523-4726
(704) 525-3953 fax

Field Report

Date June 8, 2012	Job No. 1356-11-032-03
Project/Location MSS IND. LF#1 - Cells 3 & 4	
Contractor Southland	Weather/Temp Sunny / 80's
Present at Site Brad Mayhew	
Time 8.0	Mileage 80.0

Services Performed

- | | |
|---|--|
| <input type="checkbox"/> Concrete Testing | <input type="checkbox"/> Asphalt Coring |
| <input type="checkbox"/> Cylinder Pickup | <input type="checkbox"/> Concrete Coring |
| <input type="checkbox"/> Asphalt Testing | <input type="checkbox"/> Undercut Evaluation |
| <input type="checkbox"/> Steel Testing | <input type="checkbox"/> Foundation Evaluation |
| | <input type="checkbox"/> Proofrolling |
| | <input type="checkbox"/> In-Place Density |

☒ Other (Explain)

Clay liner excavation

To: File

Observations/Remarks:

- Onsite @ 9am. Observe Southland excavating compacted soil liner material in vicinity of test pit 8. One tandem-axle dump truck, hauling today ~ 50 loads stockpiled today. Excavation depth on average of 4 feet today. Left site @ 3:55pm.

On-Site Representative/Company

Jimmy Adkins

S&ME Personnel

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S&ME

ENGINEERING • TESTING
ENVIRONMENTAL SERVICES

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Charlotte, NC 28273
(704) 523-4726
(704) 525-3953 fax

FIELD REPORT

Date:

June 11, 2012

Job No.:

1356-11-032-03

Project/Location:

MSS Ind. LF # 1- Cells 3 & 4

Contractor:

Southland

Weather/Temperature:

Cloudy/70's

Present at Site:

Jesse

Time:

5.0

Mileage:

80.0

Services Performed

- | | |
|---|--|
| <input type="checkbox"/> Concrete Testing | <input type="checkbox"/> Asphalt Coring |
| <input type="checkbox"/> Cylinder Pickup | <input type="checkbox"/> Concrete Coring |
| <input type="checkbox"/> Asphalt Testing | <input type="checkbox"/> Undercut Evaluation |
| <input type="checkbox"/> Steel Testing | <input type="checkbox"/> Foundation Evaluation |
| | <input type="checkbox"/> Proofrolling |
| | <input type="checkbox"/> In-Place Density |

☒ Other (Explain)

CSL excavation

To: File

Observations/Remarks:

S&ME technician onsite at 8:30 am. Observe contractor as they excavate compacted soil liner material East of test pit #8. Used up soils in this area today, which were red/orange clayey silt, average depth was 2 feet. A total of 28 loads stockpiled today, contractor only had one tandem-axle dump truck hauling. Contractor to use the remainder of today to dress up around TP-8 and get positive drainage out of, also will prepare to move to the North side and resume CSL excavation tomorrow weather permitting. I left site at 11:45 am.

Jimmy Addis

On-Site Representative/Company

S&ME Personnel

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Field Report

Date June 13, 2012	Job No. 1356-11-032-03
Project/Location MSS Ind. LF #1 - Cells 3 & 4	
Contractor Southland	Weather/Temp Sunny / 80's
Present at Site Brad Mayhew	
Time 7.0	Mileage 80.0

To: File

Services Performed

- | | |
|---|--|
| <input type="checkbox"/> Concrete Testing | <input type="checkbox"/> Asphalt Coring |
| <input type="checkbox"/> Cylinder Pickup | <input type="checkbox"/> Concrete Coring |
| <input type="checkbox"/> Asphalt Testing | <input type="checkbox"/> Undercut Evaluation |
| <input type="checkbox"/> Steel Testing | <input type="checkbox"/> Foundation Evaluation |
| | <input type="checkbox"/> Proofrolling |
| | <input type="checkbox"/> In-Place Density |

☒ Other (Explain)

CSL excavation

Observations/Remarks:

I called Jason Mayhew, who is on vacation this week at 8:00am this morning to inquire if his guys were working today. Jason said he thought they were not going to work, due to wet conditions from rain overnight. Got a call back from Jason around 9:30am, said his guys were going to work, have been bladeing off mud and made new haul road. I got onsite at 11:30am. Southland had hauled 7 loads out of test pit #1 area. The compacted soil liner (CSL) depth of excavation was only about 2 to 3 feet, report on test pit data list 6 feet in TP-1, I don't see it that deep. I had operator dig down from minus 3 to 6 feet below TP-1, and the soils go from tan to yellow brown to brown sandy micaceous silt. I called Kyle to discuss situation. Southland moved North of TP-1, CSL depth averaging 4 feet in this area. A total of 40 loads stock-piled today. Southland utilizing a CAT 320 trackhoe and two tandem-axle dump trucks, also John Deere 750 dozer on stockpile. I left site at 5:30pm.

On-Site Representative/Company

Jimmy Adkins

S&ME Personnel

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Field Report

Date June 15, 2012 Job No. 1356-11-032-03

Project/Location MSS Ind. LF #1 - Cells 3 & 4

Contractor Southland/SEFA Weather/Temp Sunny-windy / 80's

Present at Site
Brad Mayhew
Steve Faucette

Services Performed	
<input type="checkbox"/> Concrete Testing	<input type="checkbox"/> Asphalt Coring
<input type="checkbox"/> Cylinder Pickup	<input type="checkbox"/> Concrete Coring
<input type="checkbox"/> Asphalt Testing	<input type="checkbox"/> Undercut Evaluation
<input type="checkbox"/> Steel Testing	<input type="checkbox"/> Foundation Evaluation
	<input type="checkbox"/> Proofrolling
	<input type="checkbox"/> In-Place Density

☒ Other (Explain)
CSL excavation

Time 8.0 Mileage 80.0

To: File

Observations/Remarks:

S&ME technician onsite at 8:30 am. Observe Southland excavating compacted soil liner in vicinity of test pit 1. Top foot of material is red/orange clayey silt: 1 to 3 ft. is orange clayey silt, below 3 ft. turns brown to yellow brown silt w/ some white coloration. Average depth of cut is 3 feet. SEFA hauling flyash for subgrade construction in cell 4. I ran two field density test (fldt) today, both test exceed 95% compaction, and were w/in the required moisture criteria. Informed Alberto of test results, refer to attached data sheet. Southland stockpiled 71 loads on the Thur. 14th. When I left jobsite today at 3:30 they had 35 loads.

On-Site Representative/Company

Jimmy Addis
S&ME Personnel

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9751 Southern Pine Blvd
Charlotte, NC 28273
(704) 523-4726
(704) 525-3953 fax

Field Report

Date June 19, 2012	Job No. 1356-11-032-03
Project/Location MSS Ind. LF#1- Cells 3 & 4	
Contractor Southland	Weather/Temp Sunny-Hot/90's
Present at Site Brad Mayhew Danny Cox	
Time 7.5	Mileage 80.0

To: File

Services Performed	
<input type="checkbox"/> Concrete Testing	<input type="checkbox"/> Asphalt Coring
<input type="checkbox"/> Cylinder Pickup	<input type="checkbox"/> Concrete Coring
<input type="checkbox"/> Asphalt Testing	<input type="checkbox"/> Undercut Evaluation
<input type="checkbox"/> Steel Testing	<input type="checkbox"/> Foundation Evaluation
	<input type="checkbox"/> Proofrolling
	<input type="checkbox"/> In-Place Density
<input checked="" type="checkbox"/> Other (Explain) CSL excavation	

Observations/Remarks:

S&ME technician onsite at 9:30 am. Observe Southland excavating compacted soil liner (CSL) material South of TP-1 in grid B3. CSL cut was deeper today, averaging about 4 feet. Material from 0 to 3 ft. was orange brown fine sandy silty clay ~ 3 to 6 ft. brown orange sandy clayey silt. Southland utilizing a CAT 330 trackhoe and two tandem-axle dump trucks. I picked up bulk sample #6 and transported to soils lab for testing. I left site at 3pm. *110 loads of CSL stockpiled yesterday.

On-Site Representative/Company

Jimmy Adkins
S&ME Personnel

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FIELD REPORT

Date:

06/25/12

Job No.:

1356-11-032-03

Project/Location:

Marshall Industrial LF - Cells 3 & 4 / Terrell, NC

Contractor:

Southland
Excavating

Weather/Temperature:

Sunny / 90s

Present at Site:

Jason Mayhew, Southland Excavating;
Kyle Baucom, S&ME, Inc.

Time:

10:45 AM - 12:15
PM

Mileage:

90

Services Performed

- | | |
|---|--|
| <input type="checkbox"/> Concrete Testing | <input type="checkbox"/> Asphalt Coring |
| <input type="checkbox"/> Cylinder Pickup | <input type="checkbox"/> Concrete Coring |
| <input type="checkbox"/> Asphalt Testing | <input type="checkbox"/> Undercut Evaluation |
| <input type="checkbox"/> Steel Testing | <input type="checkbox"/> Foundation Evaluation |
| | <input type="checkbox"/> Proofrolling |
| | <input type="checkbox"/> In-Place Density |

☒ Other (Explain)

To: File

Observations/Remarks:

Arrived on-site at 10:45 AM. Met with Jason Mayhew with Southland Excavating. He explained that they had excavated approximately 5,000 to 6,000 cubic yards of future compacted soil liner material to date and approximately 6,000 cubic yards of topsoil that was stockpiled in Cell 1. Based on the existing grade and 2H:1V tie-in to the excavated grades, it appeared that approximately 3 to 4 feet of material had been excavated in the northern portion of the Cells 3 & 4 cleared area. I explained that a bulk sample from 4 to 7 feet deep was collected at Test Pit 9, and it classified as a ML material and resulted in a permeability of approximately 5×10^{-6} cm/sec, which was less than the required 1×10^{-5} cm/sec. I explained that similar material was also located at depths of 7 and 8 feet in Test Pits 1, 2, 3, and 4, and that as long as the material was consistent in this area with the test pits, then Southland could likely excavate another 3 to 4 feet in this area for compacted soil liner material. I also explained that they could excavate a little steeper than a 2H:1V to get some more material out of the slope. Jason explained that SEFA has left the southeast corner of the Cells 3 & 4 subgrade fill area open to maintain stormwater runoff. I explained that SEFA should not place in any of the excavation areas until the final survey and quantities are complete. I suggested that SEFA continue to place ash in the current location and possibly fill in the southeast corner towards the end of the excavation if they need additional area for ash placement. At approximately 11:30 AM, Jason Mayhew left the site. I continued riding around the area. The stockpile area was approximately 150 feet by 130 feet by 8 feet (or 5,800 cubic yards), which was close to Jason's estimate. I also drove to the southwest corner of the Cells 3 & 4 subgrade fill area and noticed that observation M-29 had not been abandoned. I also noticed that Southland had excavated approximately 3 to 4 feet in the area of Test Pit 8. I also noticed that there was no silt fence in place in the southwest corner as called out on the plans. Prior to leaving the site, I contacted Jason, and made him aware that Southland could excavate another 3 to 4 feet in the area of Test Pit 8 and that they should install silt fence in the area of the southwest corner. Before leaving the site, I drove to the area of the existing transmission line to be relocated with the construction of Cells 3 & 4. Left the site at approximately 12:15 PM.

Kyle Baucom

On-Site Representative/Company

S&ME Personnel

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Field Report

Date

July 2, 2012

Job No.

1356-11-032-03

Project/Location

MSS Ind. 1F#1- Cells 3 & 4

Contractor

Southland

Weather/Temp

Sunny / 90's

Present at Site

Brad Mayhew

Time

4.5

Mileage

80.0

Services Performed

- | | |
|---|--|
| <input type="checkbox"/> Concrete Testing | <input type="checkbox"/> Asphalt Coring |
| <input type="checkbox"/> Cylinder Pickup | <input type="checkbox"/> Concrete Coring |
| <input type="checkbox"/> Asphalt Testing | <input type="checkbox"/> Undercut Evaluation |
| <input type="checkbox"/> Steel Testing | <input type="checkbox"/> Foundation Evaluation |
| | <input type="checkbox"/> Proofrolling |
| | <input type="checkbox"/> In-Place Density |

☒ Other (Explain)

CSL excavation

To: File

Observations/Remarks:

S&ME technician onsite at 10 am. Southland was advised by Kyle Baucum last week to go over test pit 1 area again and deepen excavation. I observed compacted soil liner (CSL) excavation in grid A3, while onsite. A 5 to 7 foot cut was being taken out. Top 2 to 3 feet was an orange brown fine silt, below this 3 to 7 feet was lite orange to brown f.m silt. I recommended to Southland to shallow up cut by 3 to 4 feet, due to materials being to silty. I left site @ 12:45.

On-Site Representative/Company

Jimmy Addis
S&ME Personnel

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Field Report

Date	Job No.
July 5, 2012	1356-11-032-03
Project/Location	
MSS Ind. LF #1-Cells 3 & 4	
Contractor	Weather/Temp
SEFA/Southland	Sunny/90's
Present at Site	
Ronnie Puckett Brad Mayhew	
Time	Mileage
7.0	80.0

To: File

Services Performed	
<input type="checkbox"/> Concrete Testing	<input type="checkbox"/> Asphalt Coring
<input type="checkbox"/> Cylinder Pickup	<input type="checkbox"/> Concrete Coring
<input type="checkbox"/> Asphalt Testing	<input type="checkbox"/> Undercut Evaluation
<input type="checkbox"/> Steel Testing	<input type="checkbox"/> Foundation Evaluation
	<input type="checkbox"/> Proofrolling
	<input checked="" type="checkbox"/> In-Place Density
<input checked="" type="checkbox"/> Other (Explain)	
CSL Excavation	

Observations/Remarks:

S&ME technician onsite at 10:15 am. Observe SEFA placing structural fill in future Cell 4 ~ grid line C. SEFA utilizing a CAT D6 dozer to place flyash fill in approximately 12 to 18 inch lift. Two 40 ton offroad trucks hauling today. A 40 ton offroad water truck wetting flyash and rolling in for compactive effort. I ran three field density test on in place flyash, all test exceed 95% compaction, and were w/in the moisture criteria. Informed contractor of test results. Picked up SG-3 proctor sample ~ log into soils lab.

Observe Southland excavating compacted soil liner (CSL) in vicinity of test pit #9. Depth: 0 to 2' Red Orange clayey silt / 2 to 5' Orange clayey silt / 5 to 7' Brown silt. Depth of cut averaging 6'. Two tandem-axle dump trucks hauling CSL to stockpile area. I left jobsite at 3:15 pm.

On-Site Representative/Company

Jimmy Adkins
S&ME Personnel

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Field Report

Date July 9, 2012	Job No. 1356-11-032-03
Project/Location MSS Ind. LF#1-Cells 3 & 4	
Contractor Southland	Weather/Temp Sunny / 90's
Present at Site Jason Mayhew	
Time 6.0	Mileage 80.0

To: File

Services Performed	
<input type="checkbox"/> Concrete Testing	<input type="checkbox"/> Asphalt Coring
<input type="checkbox"/> Cylinder Pickup	<input type="checkbox"/> Concrete Coring
<input type="checkbox"/> Asphalt Testing	<input type="checkbox"/> Undercut Evaluation
<input type="checkbox"/> Steel Testing	<input type="checkbox"/> Foundation Evaluation
	<input type="checkbox"/> Proofrolling
	<input type="checkbox"/> In-Place Density
<input checked="" type="checkbox"/> Other (Explain) CSL excavation	

Observations/Remarks:

S&ME technician onsite at 9:45am. Observe contractor preparing side slope to resume compacted soil liner (CSL) excavation. Contractor excavating today between test pits 4 and 9 approximately. Material from 0-3' Red to Orange Brown Clayey Silt ~ 3-7' Brown Silt. Updated Kyle Bancom on construction activity, and per Jason's request for Kyle to schedule surveyors this week. Contractor utilizing a CAT 330 trackhoe and two tandem-axle dump trucks. I left site at 2:30pm.

On-Site Representative/Company


S&ME Personnel

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Field Report

Date	Job No.
July 12, 2012	1356-11-032-03
Project/Location	
MSS Ind. LF #1 - Cells 3 & 4	
Contractor	Weather/Temp
SEFA/Southland	Cloudy/80's
Present at Site	
Jerry Combs Brad Mayhew	
Time	Mileage
7.0	80.0

To: File

Services Performed	
<input type="checkbox"/> Concrete Testing	<input type="checkbox"/> Asphalt Curing
<input type="checkbox"/> Cylinder Pickup	<input type="checkbox"/> Concrete Coring
<input type="checkbox"/> Asphalt Testing	<input type="checkbox"/> Undercut Evaluation
<input type="checkbox"/> Steel Testing	<input type="checkbox"/> Foundation Evaluation
	<input type="checkbox"/> Proofrolling
	<input checked="" type="checkbox"/> In-Place Density
<input checked="" type="checkbox"/> Other (Explain)	
CSL excavation	

Observations/Remarks:

S&ME representative onsite at 10:15 am. Observe SEFA placing subgrade fill (flyash) in future Cell 4 ~ grids B3 and B4. A CAT D6 spreading flyash in approximately one foot thick lift, tracking in as placed. A Volvo 40 ton offroad truck wetting and rolling in flyash behind the dozer operation. I performed two field density test (fdt) today (#s 23-24) in grids B3 and B4. Both fdt's passed required compaction and were w/in the moisture criteria. Informed contractor of test results. No subgrade fill placed this afternoon.

Monitor Southland excavating compacted soil liner material out of the Southwest area (TP-8 vicinity). Area excavated previously, but Kyle Baucum recommended this week to go over area one more time. Depth of cut was 4ft. (+/-) 0-2' Orange Brown Si ~ 2-4' white Tan Yellow Si.
* Rough estimate of CSL stockpile: N half $105 \times 225 \times 9 = 7875$
Pickup sample SG-4, left site @ 4:30. S half $105 \times 225 \times 14 = 12,250$
20,125cy

On-Site Representative/Company

Jimmy Addis

S&ME Personnel

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Field Report

Date	July 19, 2012	Job No.	1356-11-032-03
Project/Location		MSS Ind LF #1 - Cells 3 & 4	
Contractor		SEFA/Southland	
Weather/Temp		Sunny / 80's	
Present at Site		Rannie Puckett Jason Mayhew	
Time		4.0	
Mileage		80.0	

Services Performed	
<input type="checkbox"/> Concrete Testing	<input type="checkbox"/> Asphalt Coring
<input type="checkbox"/> Cylinder Pickup	<input type="checkbox"/> Concrete Coring
<input type="checkbox"/> Asphalt Testing	<input type="checkbox"/> Undercut Evaluation
<input type="checkbox"/> Steel Testing	<input type="checkbox"/> Foundation Evaluation
	<input type="checkbox"/> Proofrolling
	<input type="checkbox"/> In-Place Density
<input type="checkbox"/> Other (Explain)	

To: File

Observations/Remarks:

S&ME representative onsite at 10am. Observe SEFA flooring in ~~subgrade~~ subgrade on grids B-1 and 2, started in this area on Wednesday; hopefully this area was surveyed. I did not run any compaction test. Southland in the process of dressing up the compacted soil liner stockpile, they plan on seeding next week. Southland reshaped the big slope where compacted soil liner was borrowed ~ between test pits 5 to 9.

On-Site Representative/Company

Jimmy Adonis
S&ME Personnel

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Field Report

Date	Job No.
July 23, 2012	1356-11-032-03
Project/Location	
MSS Ind. LF #1-Cells 3 & 4	
Contractor	Weather/Temp
SEFA	Sunny / 70-90's
Present at Site	
Ronnie Puckett Alberto	
Time	Mileage
7.0	80.0

Services Performed	
<input type="checkbox"/> Concrete Testing	<input type="checkbox"/> Asphalt Coring
<input type="checkbox"/> Cylinder Pickup	<input type="checkbox"/> Concrete Coring
<input type="checkbox"/> Asphalt Testing	<input type="checkbox"/> Undercut Evaluation
<input type="checkbox"/> Steel Testing	<input type="checkbox"/> Foundation Evaluation
	<input type="checkbox"/> Proofrolling
	<input checked="" type="checkbox"/> In-Place Density
<input type="checkbox"/> Other (Explain)	

To: File

Observations/Remarks:

S&ME representative onsite at 10am. Observe contractor placing subgrade fill (flyash) in Cells 3 & 4. Contractor utilizing a CAT D6 dozer to spread fill. A Volvo offroad water truck observed wetting fill in place and rolling in for compactive effort. I performed four field density test today. All test exceeded 95% compaction, and met moisture requirements. Refer to attached data sheet. Inform contractor of test results. Southland has not done any seeding as of yet. Left site at 3pm.

On-Site Representative/Company

Jimmy Addis
S&ME Personnel

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Field Report

Date July 25, 2012 Job No. 1356-11-032-03

Project/Location MSS Ind. LF #1 - Cells 3 & 4

Contractor SEFA Weather/Temp Cloudy / 80's

Present at Site

Time 3.0 Mileage ~~80.0~~ 80.0

Services Performed

- | | |
|---|--|
| <input type="checkbox"/> Concrete Testing | <input type="checkbox"/> Asphalt Coring |
| <input type="checkbox"/> Cylinder Pickup | <input type="checkbox"/> Concrete Curing |
| <input type="checkbox"/> Asphalt Testing | <input type="checkbox"/> Undercut Evaluation |
| <input type="checkbox"/> Steel Testing | <input type="checkbox"/> Foundation Evaluation |
| | <input type="checkbox"/> Proofrolling |
| | <input type="checkbox"/> In-Place Density |

☒ Other (Explain)
P'up proctor sample

To: file

Observations/Remarks:

Pickup sample of flyash ~ SG-5 . SEFA not hauling into
cells 3 & 4 today.

On-Site Representative/Company

Jimmy Addis
S&ME Personnel

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Field Report

Date July 30, 2012	Job No. 1356-11-032-03
Project/Location MSS Ind. LF #1 - Cells 3 & 4	
Contractor SEFA	Weather/Temp Sunny / 80's
Present at Site Ronnie Puckett	
Time 5.5	Mileage 80.0

Services Performed

- | | |
|---|--|
| <input type="checkbox"/> Concrete Testing | <input type="checkbox"/> Asphalt Curing |
| <input type="checkbox"/> Cylinder Pickup | <input type="checkbox"/> Concrete Coring |
| <input type="checkbox"/> Asphalt Testing | <input type="checkbox"/> Undercut Evaluation |
| <input type="checkbox"/> Steel Testing | <input type="checkbox"/> Foundation Evaluation |
| | <input type="checkbox"/> Proofrolling |
| | <input checked="" type="checkbox"/> In-Place Density |

☐ Other (Explain)

To: File

Observations/Remarks:

S&ME technician onsite at 9:30 am. Observe contractor placing subgrade fill (flyash) in grids B1, B2 and C2. A CAT D6 XLT dozer was spreading ash in approximately 1 foot thick lift, 3 ~ 40 ton offroad trucks hauling today. Contractor utilizing a 40 ton offroad water truck to wet and compact, as well as maintain the in place fill and haul roads. I performed three field density test, all test exceed 95% compaction, and all met moisture requirements. Inform contractor of test results. Leave site at 1pm.

On-Site Representative/Company

Jimmy Adkins
S&ME Personnel

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Field Report

Date Aug. 15, 2012	Job No. 1356-11-032-03
Project/Location MSS Ind. LF#1 Cells 3 & 4	
Contractor SEFA	Weather/Temp Cloudy / 80's
Present at Site Jerry Combs Buddy Mayberry	
Time 5.5	Mileage 80.0

To: File

Services Performed	
<input type="checkbox"/> Concrete Testing	<input type="checkbox"/> Asphalt Coring
<input type="checkbox"/> Cylinder Pickup	<input type="checkbox"/> Concrete Coring
<input type="checkbox"/> Asphalt Testing	<input type="checkbox"/> Undercut Evaluation
<input type="checkbox"/> Steel Testing	<input type="checkbox"/> Foundation Evaluation
	<input type="checkbox"/> Proofrolling
	<input checked="" type="checkbox"/> In-Place Density
<input type="checkbox"/> Other (Explain)	

Observations/Remarks:

S&ME representative onsite at 10:15 am. Observe SEFA placing subgrade fill (flyash) in grids D3 and D4. SEFA utilizing a CAT D6 XLT dozer to spread material, 3 40ton offroad dump trucks hauling today, Charrah not hauling bottom fines today. A 5000 gallon offroad water truck being used to compact, wet, and maintain subgrade fill and haul roads. I performed two field density test, both test exceed 95% compaction, and fell w/in required moisture content. Informed Alberto of test results. Left site at 1:45.

On-Site Representative/Company

S&ME Personnel

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FIELD REPORT

Date:

09/07/12

Job No.:

1356-11-032-03

Project/Location:

Marshall Industrial LF #1 - Cells 3 & 4 / Terrell, NC

Contractor:

Southland
Excavating, SEFA

Weather/Temperature:

Sunny / 90s

Present at Site:

Kyle Baucom, S&ME, Inc.

Time:

11:00 AM - 1:00
PM

Mileage:

80

Services Performed

- | | |
|---|--|
| <input type="checkbox"/> Concrete Testing | <input type="checkbox"/> Asphalt Coring |
| <input type="checkbox"/> Cylinder Pickup | <input type="checkbox"/> Concrete Coring |
| <input type="checkbox"/> Asphalt Testing | <input type="checkbox"/> Undercut Evaluation |
| <input type="checkbox"/> Steel Testing | <input type="checkbox"/> Foundation Evaluation |
| | <input type="checkbox"/> Proofrolling |
| | <input type="checkbox"/> In-Place Density |

☒ Other (Explain)

Site Visit

To: File

Observations/Remarks:

Arrived on-site at 11:00 AM. Walked the subgrade preparation area to look at erosion and sediment control measures. The existing silt fence and silt fence outlet on the west end of the area were full of sediment. Additionally, silt fence should be installed at the downstream end of the area cleared for down drain installation. The future compacted soil liner stock had little to no vegetation established resulting in rilling on the slopes and the silt fence to the south being full of sediment. Additionally, there was an erosion rill at the northwest corner of the stockpile area that resulted in a soil/ash sediment mixture in the existing channel west of the stockpile. These areas with excess sediment should be cleaned out and the erosion control measures should be repaired, if necessary.

SEFA was placing ash as subgrade in Grid C1. They were utilizing 2 Volvo A40D trucks and a dozer to transport, dump, spread, and compact the ash in place. Collected sample SG-7 for CQA laboratory testing. There was also an approximate 15-foot high slope on the south end of the subgrade fill area. This slope should be covered with 12 inches of soil cover (per .1700 structural fill rules) as SEFA works their way up with subgrade fill placement. I explained this to Robb Erwin when we met at Cell 1 and 2.

Observed and recorded total leachate pumped, pumping rates, and sump liquid levels in Cell 1 and 2. The Cell 2 LCS high flow pump did not pump when placed in manual pumping mode. However, the liquid level in the sump was approximately 13.6", which is less than the run-start liquid level of 46" for the high flow pump. This pump should be observed in the future to verify that it pumps at higher liquid levels.

Kyle Baucom

On-Site Representative/Company

S&ME Personnel

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Field Report

Date Sept. 13, 2012 Job No. 1356-11-032-03

Project/Location MSS Ind. LF #1 - Cells 3 & 4

Contractor SEFA Weather/Temp Sunny / 80's

Present at Site

Time 7.0 Mileage 80.0

Services Performed

- | | |
|---|--|
| <input type="checkbox"/> Concrete Testing | <input type="checkbox"/> Asphalt Coring |
| <input type="checkbox"/> Cylinder Pickup | <input type="checkbox"/> Concrete Coring |
| <input type="checkbox"/> Asphalt Testing | <input type="checkbox"/> Undercut Evaluation |
| <input type="checkbox"/> Steel Testing | <input type="checkbox"/> Foundation Evaluation |
| | <input type="checkbox"/> Proofrolling |
| | <input checked="" type="checkbox"/> In-Place Density |

☐ Other (Explain)

To: File

Observations/Remarks:

Onsite at 10:30. SEFA done hauling for the day. The water truck was wetting and rolling in the subgrade. I request that he wet and roll material previously placed, so I could test. I performed five field density test (#'s 36-40), all test exceeded 95% compaction, and met the moisture criteria. Picked up bulk sample SG8, log into lab. Left site at 3:30.

On-Site Representative/Company

Jimmy Addis

S&ME Personnel

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Field Report

Date 9-11-12	Job No. 01 1356-11-016
Project/Location MARSHALL SS Landfill	
Contractor	Weather/Temp Sunny/70's
Present at Site Lane - Same Tinning - Southland Jason - Excavating	
Time Arrived 1000 16.0 DEPARTURE 1230	Mileage 80.0

To: RL

Services Performed	
<input type="checkbox"/> Concrete Testing	<input type="checkbox"/> Asphalt Coring
<input type="checkbox"/> Cylinder Pickup	<input type="checkbox"/> Concrete Coring
<input type="checkbox"/> Asphalt Testing	<input type="checkbox"/> Undercut Evaluation
<input type="checkbox"/> Steel Testing	<input type="checkbox"/> Foundation Evaluation
	<input type="checkbox"/> Proofrolling
	<input checked="" type="checkbox"/> In-Place Density
<input type="checkbox"/> Other (Explain)	

Observations/Remarks:

Some personnel assisted Jimmy in loading coal (to be discarded at MARSHALL SS) on to his truck.
Some personnel on site to familiarize himself with location of landfill cells 3 & 4, and to perform POT's on fill placed and compacted @ cells 3 & 4. No POT's were performed today. Trucks working on bottom ash placement.

On-Site Representative/Company

S&ME Personnel

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Date	Job No.
Sept. 17, 2012	1356-11-032-03
Project/Location	
MSS Ind. LF#1-Cells 3 & 4	
Contractor	Weather/Temp
SEFA	Cloudy/Rain/70's
Present at Site	
Ronnie Puckett	
Time	Mileage
3.0	80.0

To: File

<input type="checkbox"/> Concrete Testing	<input type="checkbox"/> Asphalt Coring
<input type="checkbox"/> Cylinder Pickup	<input type="checkbox"/> Concrete Coring
<input type="checkbox"/> Asphalt Testing	<input type="checkbox"/> Undercut Evaluation
<input type="checkbox"/> Steel Testing	<input type="checkbox"/> Foundation Evaluation
	<input type="checkbox"/> Proofrolling
	<input type="checkbox"/> In-Place Density

☐ Other (Exploin)**Contractor**

SEFA

Present at Site

Ronnie Puckett

Weather/Temp

Cloudy / Rain / 70's

Time

3.0

Mileage	
1	100
2	200
3	300
4	400
5	500
6	600
7	700
8	800
9	900
10	1000
11	1100
12	1200
13	1300
14	1400
15	1500
16	1600
17	1700
18	1800
19	1900
20	2000
21	2100
22	2200
23	2300
24	2400
25	2500
26	2600
27	2700
28	2800
29	2900
30	3000
31	3100
32	3200
33	3300
34	3400
35	3500
36	3600
37	3700
38	3800
39	3900
40	4000
41	4100
42	4200
43	4300
44	4400
45	4500
46	4600
47	4700
48	4800
49	4900
50	5000
51	5100
52	5200
53	5300
54	5400
55	5500
56	5600
57	5700
58	5800
59	5900
60	6000
61	6100
62	6200
63	6300
64	6400
65	6500
66	6600
67	6700
68	6800
69	6900
70	7000
71	7100
72	7200
73	7300
74	7400
75	7500
76	7600
77	7700
78	7800
79	7900
80	8000
81	8100
82	8200
83	8300
84	8400
85	8500
86	8600
87	8700
88	8800
89	8900
90	9000
91	9100
92	9200
93	9300
94	9400
95	9500
96	9600
97	9700
98	9800
99	9900
100	10000

80.0

Called Ronnie to see if they were hauling, left him a voicemail. Travel to site, arrive at 10:45. SEFA hauling subgrade fill (flyash), trying to fill in low area (app. D2) where a lot of bottom fines were dumped by Charah last week. Mixing flyash being hauled in today w/ the bottom fines. Have not covered areas I test on 9/13/12. Left site at 11:45.

On-Site Representative/Company

Jimmy Addis
S&ME Perso

S&ME Personnel

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(704) 523-4726
(704) 525-3953 fax

FIELD REPORT

Date:

Sept. 21, 2012

Job No.:

1356-11-032-03

Project/Location:

MSS Ind. LF #1-Cells 3&4

Contractor:

SEFA

Weather/Temperature:

Sunny/70's

Present at Site:

Alberto

Time:

7.0

Mileage:

80.0

Services Performed

- | | |
|---|--|
| <input type="checkbox"/> Concrete Testing | <input type="checkbox"/> Asphalt Coring |
| <input type="checkbox"/> Cylinder Pickup | <input type="checkbox"/> Concrete Coring |
| <input type="checkbox"/> Asphalt Testing | <input type="checkbox"/> Undercut Evaluation |
| <input type="checkbox"/> Steel Testing | <input type="checkbox"/> Foundation Evaluation |
| | <input type="checkbox"/> Proofrolling |
| | <input checked="" type="checkbox"/> In-Place Density |

☐ Other (Explain)

To: File

Observations/Remarks:

S&ME representative onsite at 9:30. Observe contractor placing subgrade fill (flyash) on D line. Contractor utilizing a CAT D6T dozer to spread fill, and a CAT 40 ton articulate water truck to wet and compact fill. I performed 5 fdt's today, had 1 failing test (low moisture) other fdt's all passed. Recommended that non-compliance test area be reworked for retest which passed. Inform contractor of test results, refer to attached data sheet. Pick up proctor sample SG-9, log into lab. Called Ronnie Puckett to discuss erosion control issues which need to be addressed, Jason Mayhew not onsite. Left jobsite at 2:30.

Jimmy Addis

On-Site Representative/Company

S&ME Personnel

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FIELD REPORT

Date: Sept. 25, 2012		Job No.: 1356-11-032-03	
Project/Location: MSS Ind. LF #1- Cells 3&4 Subgrade Prep.			
Contractor: Southland		Weather/Temperature: Sunny/70's	
Present at Site: Jason Mayhew Jerry Combs/Ronnie Puckett			
Time: 6.0		Mileage: 80.0	

Services Performed

- | | |
|---|--|
| <input type="checkbox"/> Concrete Testing | <input type="checkbox"/> Asphalt Coring |
| <input type="checkbox"/> Cylinder Pickup | <input type="checkbox"/> Concrete Coring |
| <input type="checkbox"/> Asphalt Testing | <input type="checkbox"/> Undercut Evaluation |
| <input type="checkbox"/> Steel Testing | <input type="checkbox"/> Foundation Evaluation |
| | <input type="checkbox"/> Proofrolling |
| | <input type="checkbox"/> In-Place Density |

☐ Other (Explain)

To: File

Observations/Remarks:

S&ME representative onsite at 10am. Observe that SEFA was not working/hauling into Cells 3&4 today. Spoke with Jerry and Ronnie and ask them to cover the South slope of the subgrade fill with soil and stabilize. This will aid in the erosion control of the flyash as per Kyle Baucom's request. Southland had Plastic Fusion (PFF) onsite today. PFF fused 42 inch SDR 32.5 solid wall HDPE pipe today. Four 50 foot joints welded together for Downdrain #2. Southland did not center pipeline as of yet, only weld inplace thus far. Talk with Jason about mucking out silt fence outlet area, and of constructing soil berm across this area. Southland has some grading to perform upstream of downdrain #2 to make it work. Southland also reseeded the compacted soil liner stockpile today. Took pictures and left site at 2pm.

Jimmy Addis

On-Site Representative/Company

S&ME Personnel

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Field Report

Date Sept. 28, 2012 Job No. 1356-11-032-03

Project/Location MSS Ind. LF-Cells 3 & 4

Contractor SEFA Weather/Temp Sunny / 80's

Present at Site Alberto

Time 6.0 Mileage 80.0

Services Performed

- | | |
|---|--|
| <input type="checkbox"/> Concrete Testing | <input type="checkbox"/> Asphalt Coring |
| <input type="checkbox"/> Cylinder Pickup | <input type="checkbox"/> Concrete Coring |
| <input type="checkbox"/> Asphalt Testing | <input type="checkbox"/> Undercut Evaluation |
| <input type="checkbox"/> Steel Testing | <input type="checkbox"/> Foundation Evaluation |
| | <input type="checkbox"/> Proofrolling |
| | <input checked="" type="checkbox"/> In-Place Density |

☐ Other (Explain)

To: File

Observations/Remarks:

Onsite at 9:45am. Observe contractor placing structural fill for subgrade prep. in Cell 4. Contractor utilizing a CAT D6T dozer to spread and track flyash. SEFA operator continues to bench into existing slope fills, both flyash and soil, upon my request. Forty ton offroad water truck wetting and compacting fill today, also maintaining fill and haul roads for dust control. I ran three field density test (shelby tube method) today (#s 4648), all test exceed 95% compaction, and were w/in the moisture criteria. Inform Alberto of test results. Leave site at 2pm. Southland Excavating not onsite.

On-Site Representative/Company

Jimmy Adkins

S&ME Personnel

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FIELD REPORT

Date:

Oct. 3, 2012

Job No.:

1356-11-032-03

Project/Location:

MSS Ind. LF # 1-Cells 3&4

Contractor:

SEFA

Weather/Temperature:

Partly Cloudy/70"s

Present at Site:

Ronnie Puckett

Time:

7.0

Mileage:

80.0

Services Performed

- | | |
|---|--|
| <input type="checkbox"/> Concrete Testing | <input type="checkbox"/> Asphalt Coring |
| <input type="checkbox"/> Cylinder Pickup | <input type="checkbox"/> Concrete Coring |
| <input type="checkbox"/> Asphalt Testing | <input type="checkbox"/> Undercut Evaluation |
| <input type="checkbox"/> Steel Testing | <input type="checkbox"/> Foundation Evaluation |
| | <input type="checkbox"/> Proofrolling |
| | <input checked="" type="checkbox"/> In-Place Density |
| <input type="checkbox"/> Other (Explain) | |

To: File

Observations/Remarks:

S&ME representative onsite at 9:55 am. Observe SEFA placing structural fill for subgrade preparation in Cell 4. SEFA utilizing a CAT D6T dozer to spread flyash, lifts approximately one foot thick. A 40 ton offroad water truck being used to wet and compact the flyash and control dust. I performed four field density test (shelby tube method) today. All test exceed 95% compaction, and were w/in the moisture criteria of +/- 3% of optimum. Inform SEFA of test results. Speak with Ronnie about erosion control, since Southland was not onsite. None of the issues discussed last week have been addressed. Site had 2 inches of rainfall this past Monday/Tuesday. Ronnie to talk with Southland about significance of installing E&SC features, and will assist if need be. I left jobsite at 3:30pm.

Jimmy Addis

On-Site Representative/Company

S&ME Personnel

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**S&ME**ENGINEERING • TESTING
ENVIRONMENTAL SERVICES9751 Southern Pine Blvd.
Charlotte, NC 28273
(704) 523-4726
(704) 525-3953 fax**FIELD REPORT****Date:**

Oct. 8, 2012

Job No.:

1356-11-032-03

Project/Location:

MSS Ind. LF #1-Cells 3&4

Contractor:

SEFA

Weather/Temperature:

Cloudy-Misty/60's

Present at Site:

Ronnie Puckett

Time:

7.0

Mileage:

80.0

Services Performed

- | | |
|---|--|
| <input type="checkbox"/> Concrete Testing | <input type="checkbox"/> Asphalt Coring |
| <input type="checkbox"/> Cylinder Pickup | <input type="checkbox"/> Concrete Coring |
| <input type="checkbox"/> Asphalt Testing | <input type="checkbox"/> Undercut Evaluation |
| <input type="checkbox"/> Steel Testing | <input type="checkbox"/> Foundation Evaluation |
| | <input type="checkbox"/> Proofrolling |
| | <input checked="" type="checkbox"/> In-Place Density |

☐ Other (Explain)

To: File

Observations/Remarks:

S&ME representative traveled to site, arriving at 10:05am. So Ronnie on the haul road and stopped to talk w/ him about construction activity since my last visit, and gave him Cells 3&4 E&SC plan sheets 2 to 7. No activity as of yet on any erosion control issues. Site had an inch or more of rainfall yesterday. Ronnie said they were hauling today. Observe SEFA placing structural fill for subgrade in Cell 4 today. SEFA had three 40 ton offroad trucks hauling flyash, to the North side of Cell 4, and Charah had one tri-axle truck hauling bottom fines which were being dumped in the middle of Cell 4. I performed three field density test (FDT) today, all FDT's exceeded 95% compaction and were w/in the required moisture criteria of +/- 3%. Informed SEFA of test results. Picked up proctor sample SG-10, transport to lab and log in. I left jobsite at 3:15 pm.

Jimmy Addis

On-Site Representative/Company**S&ME Personnel**

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FIELD REPORT

Date:

Oct. 15, 2012

Job No.:

1353-11-032-03

Project/Location:

MSS Ind. LF #1-Cells 3&4 Subgrade Prep.

Contractor:

SEFA

Weather/Temperature:

Cloudy-showers/60's

Present at Site:

Time:

3.0

Mileage:

80.0

Services Performed

- | | |
|---|--|
| <input type="checkbox"/> Concrete Testing | <input type="checkbox"/> Asphalt Coring |
| <input type="checkbox"/> Cylinder Pickup | <input type="checkbox"/> Concrete Coring |
| <input type="checkbox"/> Asphalt Testing | <input type="checkbox"/> Undercut Evaluation |
| <input type="checkbox"/> Steel Testing | <input type="checkbox"/> Foundation Evaluation |
| | <input type="checkbox"/> Proofrolling |
| | <input type="checkbox"/> In-Place Density |
| <input type="checkbox"/> Other (Explain) | |

To: File

Observations/Remarks:

Onsite at 9:40 am. Walk in and strip form off FGD LF MS-12. Backfill around new concrete pad. Travel to Cells 3&4 contractor not hauling today. Called Ronnie Puckett, never returned my call. Southland also not doing any construction activity in Cells 3&4. I left site at 10:45 am.

Jimmy Addis

On-Site Representative/Company

S&ME Personnel

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FIELD REPORT

Date:

Oct.18,2012

Job No.:

1356-11-032-03

Project/Location:

MSS Ind. LF #1 Cells 3&4

Contractor:

SEFA

Weather/Temperature:

Partly cloudy/70's

Present at Site:

Time:

4.5

Mileage:

80.0

Services Performed

- | | |
|---|--|
| <input type="checkbox"/> Concrete Testing | <input type="checkbox"/> Asphalt Coring |
| <input type="checkbox"/> Cylinder Pickup | <input type="checkbox"/> Concrete Coring |
| <input type="checkbox"/> Asphalt Testing | <input type="checkbox"/> Undercut Evaluation |
| <input type="checkbox"/> Steel Testing | <input type="checkbox"/> Foundation Evaluation |
| | <input type="checkbox"/> Proofrolling |
| | <input type="checkbox"/> In-Place Density |

☐ Other (Explain)

To: File

Observations/Remarks:

S&ME representative onsite at noon. Look at E&SC progress, Southland has installed tie-down stakes on downdrain (DD) #2 every 20 ft. beyond berm to end of pipeline. Dug out for sediment storage in front of inlet protection for DD #2. Silt fence has been put up behind soil berm along clearing limits and at apron #2, along each side of the 42 inch pipe. Area needs to be stabilized. Compacted soil liner stockpile stabilization coming along well, a few reels on the slopes noticed. Pictures taken of these areas.

Observe SEFA placing bottom ash in Cell 4 grids A3 and A4 this is in the drainage area leading to downdrain # 2. I did not run any field density test today. SEFA has covered most of the North slope of Cell 4 with soil. It appears to be at least 18 inches thick and should support vegetative cover. I left site at 2:15 pm.

Jimmy Addis

On-Site Representative/Company

S&ME Personnel

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FIELD REPORT

Date:

Oct. 22, 2012

Job No.:

1356-11-032-03

Project/Location:

MSS Ind. LF #1 - Cells 3&4 Subgrade Prep.

Contractor:

SEFA

Weather/Temperature:

Sunny/70's

Present at Site:

Ronnie Puckett

Time:

7.0

Mileage:

80.0

Services Performed

- | | |
|---|--|
| <input type="checkbox"/> Concrete Testing | <input type="checkbox"/> Asphalt Coring |
| <input type="checkbox"/> Cylinder Pickup | <input type="checkbox"/> Concrete Coring |
| <input type="checkbox"/> Asphalt Testing | <input type="checkbox"/> Undercut Evaluation |
| <input type="checkbox"/> Steel Testing | <input type="checkbox"/> Foundation Evaluation |
| | <input type="checkbox"/> Proofrolling |
| | <input checked="" type="checkbox"/> In-Place Density |
| <input type="checkbox"/> Other (Explain) | |

To: File

Observations/Remarks:

S&ME representative onsite at 9:30 am. Observe SEFA placing structural fill in Cell 4 for subgrade. SEFA utilizing a CAT D6T dozer to spread flyash in approximately a one foot thick lift. A CAT 40 ton offroad water truck being used to wet and compact the flyash. I waited on the water truck to prepare an area for testing. Today I performed four field density test (shelby tube method), all test exceed 95% compaction and met the moisture criteria of +/- 3% of optimum. I informed SEFA of today's test results, refer to attached data sheet. I left jobsite at 2:30 pm.

Jimmy Addis

On-Site Representative/Company

S&ME Personnel

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Field Report

To: pile

Services Performed

- | | |
|---|--|
| <input type="checkbox"/> Concrete Testing | <input type="checkbox"/> Asphalt Coring |
| <input type="checkbox"/> Cylinder Pickup | <input type="checkbox"/> Concrete Coring |
| <input type="checkbox"/> Asphalt Testing | <input type="checkbox"/> Undercut Evaluation |
| <input type="checkbox"/> Steel Testing | <input type="checkbox"/> Foundation Evaluation |
| | <input type="checkbox"/> Proofrolling |
| | <input checked="" type="checkbox"/> In-Place Density |
| <input type="checkbox"/> Other (Explain) | |

Date <u>11-1-12</u>	Job No. <u>1356-11-032(03)</u> 1356-11-016-04
Project/Location <u>MARSHALL STEAMSTATION LANDFILL</u> ^{Testing Services}	
Contractor <u>SEPA</u>	Weather/Temp <u>Sunny / 60's</u>
Present at Site <u>RAM - S&ME</u> <u>ALBERT - SEPA</u>	
Time Arrived Time <u>7.5</u> ⁰⁸⁰⁰ Departure Time <u>1330</u>	Mileage <u>80.0</u>

Observations/Remarks:

Some personnel on site as requested to perform FDT's on fill placed and compacted @ CELL-3, C-1. 6 FDT's were performed on fill placed. All FDT's met the 95% compaction requirement and the $\pm 5\%$ moisture requirement. Ash being spread from east to west by a D6T XL cat bulldozer. Compactions are accomplished after ash is hydrated, it is tamped in by the bulldozer.

On-Site Representative/Company

S&ME Personnel

NOV 2 2012

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FIELD REPORT

Date:

11/2/12

Job No.:

1356-11-032-03

Project/Location:

Marshall Industrial LF No. 1 Cells 3 & 4 / Terrell, NC

Contractor:

SEFA

Weather/Temperature:

sunny / 50s

Present at Site:

Kyle Baucom, S&ME, Inc.

Time:

10:00 AM - 11:30 AM

Mileage:

80 miles

Services Performed

- | | |
|---|--|
| <input type="checkbox"/> Concrete Testing | <input type="checkbox"/> Asphalt Coring |
| <input type="checkbox"/> Cylinder Pickup | <input type="checkbox"/> Concrete Coring |
| <input type="checkbox"/> Asphalt Testing | <input type="checkbox"/> Undercut Evaluation |
| <input type="checkbox"/> Steel Testing | <input type="checkbox"/> Foundation Evaluation |
| | <input type="checkbox"/> Proofrolling |
| | <input type="checkbox"/> In-Place Density |

☒ Other (Explain)

Site observation

To: File

Observations/Remarks:

S&ME representative on-site at 10:00 AM to observe Cells 3 & 4 construction progress. Compacted soil liner stockpile appeared to have a good stand of vegetation. There were some minor erosion rills on the slopes. SEFA had placed 18 inches of intermediate soil cover on the majority of the south slope. Southland Excavating had finished installing the erosion and sediment control (E&SC) measures consisting of down drain pipe, pipe inlet protection, riprap apron outlet, and the soil diversion berm around the down drain pipe inlet. E&SC measures appeared to be installed correctly. SEFA was hauling ash to Grid D2 as part of the Cells 3 and 4 structural fill subgrade.

S&ME representative drove to the existing road between the closed asbestos and C&D landfills to perform field measurements of the existing road width. S&ME representative left the site at 11:30 AM.

Kyle Baucom

On-Site Representative/Company

S&ME Personnel

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(704) 523-4726
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Field Report

Date 12-11-12	Job No. 1356-11-032 PHASE 3
Project/Location Mod. Cells 3+4 - MARSHALL STEAM STATION Industrial Complex	
Contractor S&ME	Weather/Temp cloudy 50's
Present at Site Egan - S&ME ALBERT - S&ME	
Time 9.0	Mileage 100.0

Services Performed

- | | |
|---|--|
| <input type="checkbox"/> Concrete Testing | <input type="checkbox"/> Asphalt Curing |
| <input type="checkbox"/> Cylinder Pickup | <input type="checkbox"/> Concrete Coring |
| <input type="checkbox"/> Asphalt Testing | <input type="checkbox"/> Undercut Evaluation |
| <input type="checkbox"/> Steel Testing | <input type="checkbox"/> Foundation Evaluation |
| | <input type="checkbox"/> Proofrolling |
| | <input checked="" type="checkbox"/> In-Place Density |
| <input type="checkbox"/> Other (Explain) | |

To: File

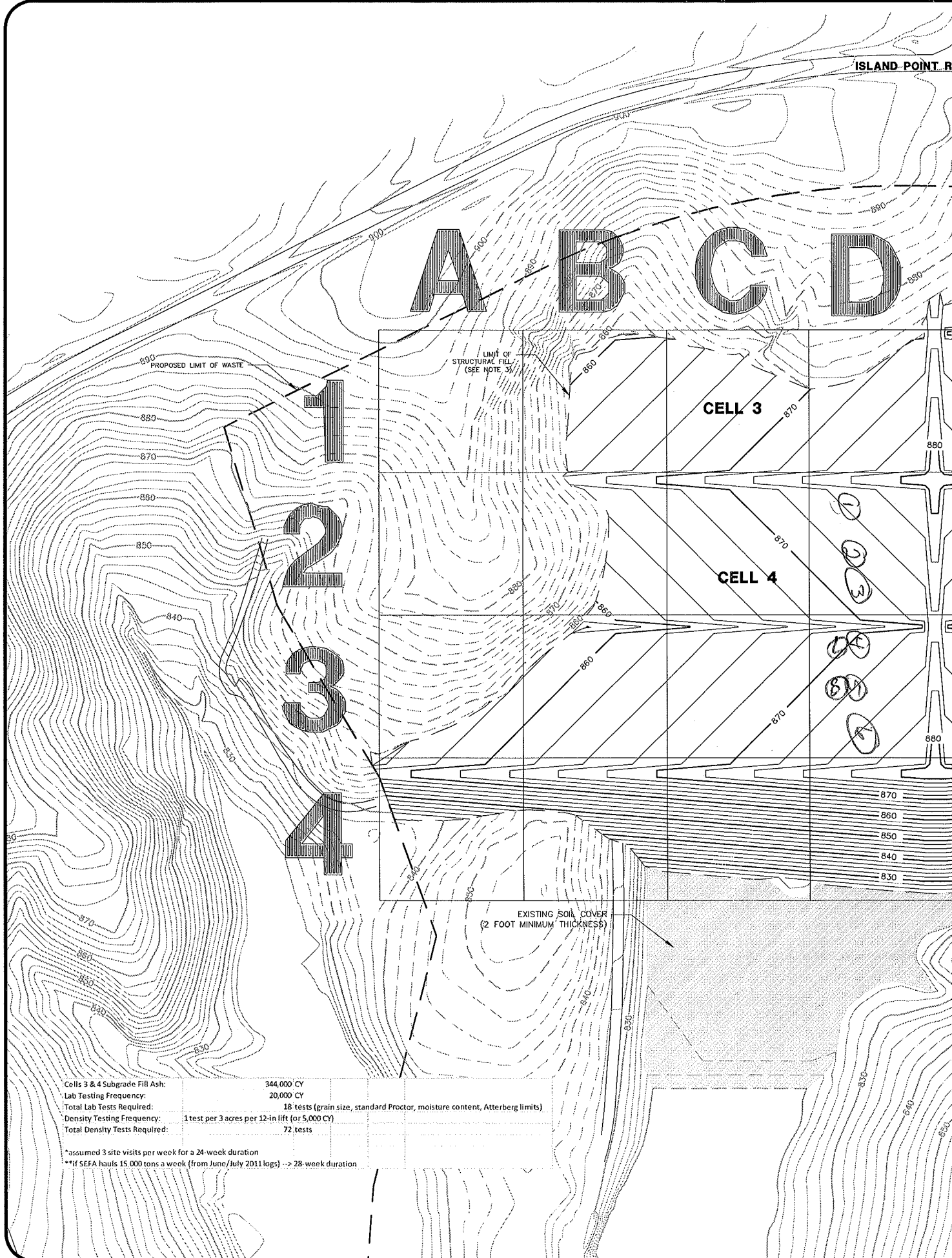
Observations/Remarks:

Some personnel on site as requested to perform RDT's on fill placed and compacted @ Cells 3+4. There are 3- Volvo dump trucks in operation taking ash from Silo "B" and delivering it to the fill area. Ash is being spread from ~~North to South~~ ^{North to South} by a D6T XL cat bulldozer. Compactions are being accomplished with a 5,000 gal water tank truck 725 CAT. 8 RDT's were performed on fill placed. 2 RDT's initially failed to meet the 95% compaction requirement but after area was rehydrated and re-rolled the failed areas met the 95% compaction requirement. Several RDT's failed to meet the $\pm 5\%$ moisture requirement. Albert made aware of failures due to moisture. A soil (ASH) proctor sample was collected and taken back to lab.

On-Site Representative/Company

S&ME Personnel

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Cells 3 & 4 Subgrade Fill Ash:	344,000 CY
Lab Testing Frequency:	20,000 CY
Total Lab Tests Required:	18 tests (grain size, standard Proctor, moisture content, Atterberg limits)
Density Testing Frequency:	1 test per 3 acres per 12-in lift (or 5,000 CY)
Total Density Tests Required:	72 tests

*assumed 3 site visits per week for a 24-week duration

**If SEFA hauls 15,000 tons a week (from June/July 2011 logs) --> 28-week duration

FIELD REPORT

Date:

12/27/12

Job No.:

1356-11-032-03

Project/Location:

Marshall Industrial LF No. 1 Cells 3 & 4 / Terrell, NC

Contractor:

SEFA

Weather/Temperature:

sunny / 50s

Present at Site:

Kyle Baucom & Earl Alexander, S&ME, Inc.
Ronnie Puckett, SEFA

Time:

10:00 AM - 12:00 PM

Mileage:

80 miles

Services Performed

- | | |
|---|--|
| <input type="checkbox"/> Concrete Testing | <input type="checkbox"/> Asphalt Coring |
| <input type="checkbox"/> Cylinder Pickup | <input type="checkbox"/> Concrete Coring |
| <input type="checkbox"/> Asphalt Testing | <input type="checkbox"/> Undercut Evaluation |
| <input type="checkbox"/> Steel Testing | <input type="checkbox"/> Foundation Evaluation |
| | <input type="checkbox"/> Proofrolling |
| | <input type="checkbox"/> In-Place Density |

☒ Other (Explain)

Site observation

To: File

Observations/Remarks:

S&ME representative on-site at 10:00 AM. Drove to Cells 1 and 2 to look at the status of the erosion and sediment control (E&SC) measures at the southeast corner of Cell 2 and through the C&D and asbestos landfill borrow area. The existing east perimeter channel (EPC4) was actually constructed through the C&D and asbestos landfill borrow area rather than west of this borrow area. The first 120 feet of channel after the culvert was eroded in several areas. Additionally, several rock check dams had been eroded around. The shallower portion of the channel through the borrow area contains rock check dams, and it is vegetated and stable. It should be noted that there was previously a silt fence outlet installed at the low portion of the borrow area, and it had been eroded under and the stone had been washed out. The existing wetland downstream of the borrow area was not impacted by the borrow area, adjacent landfill closures, or adjacent stockpiling.

At 10:45, drove to Cells 3 and 4 subgrade area to meet Ronnie Puckett with SEFA. We discussed the status of the E&SC measures in the Cells 3 and 4 subgrade area. I explained that the intent of diversion channel DC-1 in the Stages 4 & 5 E&SC Plan was to prevent runoff from the upslope native ground. However, given how close SEFA is to grade, they should begin tying into the existing soil slope. I also explained to Ronnie that we would send SEFA an updated grading plan based on the revised rough subgrade plan in the Permit to Construct Revision rough subgrade drawing. Ronnie explained there was approximately 3 inches of rain at the site within the past 2 days, and that they would begin E&SC maintenance of the pipe inlet protection at Down Drain 2 and the check dams in Channel B once the area had dried up a little.

SEFA was hauling ash to Grids B3 and C3 as part of the Cells 3 and 4 structural fill subgrade. Collected bulk sample SG-13 for laboratory testing. Earl Alexander was also on-site performing field density and moisture tests. He explained that the compaction and moisture criteria were being met for the tests that he had performed. S&ME representative left the site at 12:00 PM.

Kyle Baucom

On-Site Representative/Company

S&ME Personnel

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9751 Southern Pine Blvd
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(704) 523-4726
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Field Report

Date	Job No.
1-31-13	03 1356-H-032
Project/Location	
MANHAWK Stream Station Industrial Landfill	
Contractor	Weather/Temp
SEPA	Sunny/50's
Present at Site	
ALBERT - SEPA Bane - Stone Buddy - Duke Power	
Time	Mileage
9.0 8.5 hours	100.0

To: File

Services Performed	
<input type="checkbox"/> Concrete Testing	<input type="checkbox"/> Asphalt Coring
<input type="checkbox"/> Cylinder Pickup	<input type="checkbox"/> Concrete Coring
<input type="checkbox"/> Asphalt Testing	<input type="checkbox"/> Undercut Evaluation
<input type="checkbox"/> Steel Testing	<input type="checkbox"/> Foundation Evaluation
	<input type="checkbox"/> Proofrolling
	<input checked="" type="checkbox"/> In-Place Density
<input type="checkbox"/> Other (Explain) <u>Annual 09 00 D & Anne 10 40</u>	

Observations/Remarks:

Some personnel on site as requested to perform POT's on ash placed and compacted @ landfill. Upon arriving on site SEPA placing fill west of cell #4. Per Albert of SEPA, SEPA concerned that trucks would sink on cell #4 due to the previous days rain. 6 POT's were performed on cell #4. 4 POT's failed to meet compaction requirements and 2 POT's met all requirements. ALBERT, of SEPA, was made aware of failures. Some personnel attended a Duke Power Site Specific Safety meeting with Buddy Mayberry. A ^{ASH} ~~soil~~ proton sample was collected and taken back to the Lab.

On-Site Representative/Company

S&ME Personnel

FEB 1 2013

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Field Report

Date 2-6-13	Job No. 03 1356-11-032
Project/Location MARSHALL CREEK STATION Industrial Landfill	
Contractor SEPA	Weather/Temp Sunny/60's
Present at Site BANK - SYMCO ALBERT - SEPA	
Time ✓ 6.5	Mileage 80.0

Services Performed

<input type="checkbox"/> Concrete Testing	<input type="checkbox"/> Asphalt Coring
<input type="checkbox"/> Cylinder Pickup	<input type="checkbox"/> Concrete Coring
<input type="checkbox"/> Asphalt Testing	<input type="checkbox"/> Undercut Evaluation
<input type="checkbox"/> Steel Testing	<input type="checkbox"/> Foundation Evaluation
	<input type="checkbox"/> Proofrolling
	<input checked="" type="checkbox"/> In-Place Density
<input type="checkbox"/> Other (Explain)	

To: File

Observations/Remarks:

Some personnel on site as requested to perform re-tests of failed area tests @ cell #4 on 1-31-13. 5 re-tests RBT's were performed @ failed areas. All re-tests met the 95% compaction and $\pm 5\%$ moisture requirements. SEPA was not working in cell #4 today. ALBERT, of SEPA, made aware of tests results.

On-Site Representative/Company

S&ME Personnel

FEB 7 2013

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Field Report

To: File

Services Performed

- | | |
|---|--|
| <input type="checkbox"/> Concrete Testing | <input type="checkbox"/> Asphalt Coring |
| <input type="checkbox"/> Cylinder Pickup | <input type="checkbox"/> Concrete Coring |
| <input type="checkbox"/> Asphalt Testing | <input type="checkbox"/> Undercut Evaluation |
| <input type="checkbox"/> Steel Testing | <input type="checkbox"/> Foundation Evaluation |
| | <input type="checkbox"/> Proofrolling |
| | <input checked="" type="checkbox"/> In-Place Density |
| <input type="checkbox"/> Other (Explain) | |

Date <u>2-27-13</u>	Job No. <u>PHASE 3</u> <u>1356-11-032</u>
Project/Location <u>MARSHALL STEAM STATION INDUSTRIAL LANDFILL</u>	
Contractor <u>SEPA</u>	Weather/Temp <u>Sunny / 60's</u>
Present at Site <u>Eric - SEPA</u> <u>ALBERT</u> <u>RONNIE</u>	
Time <u>7.0</u>	Mileage <u>80.0</u>

Observations/Remarks:

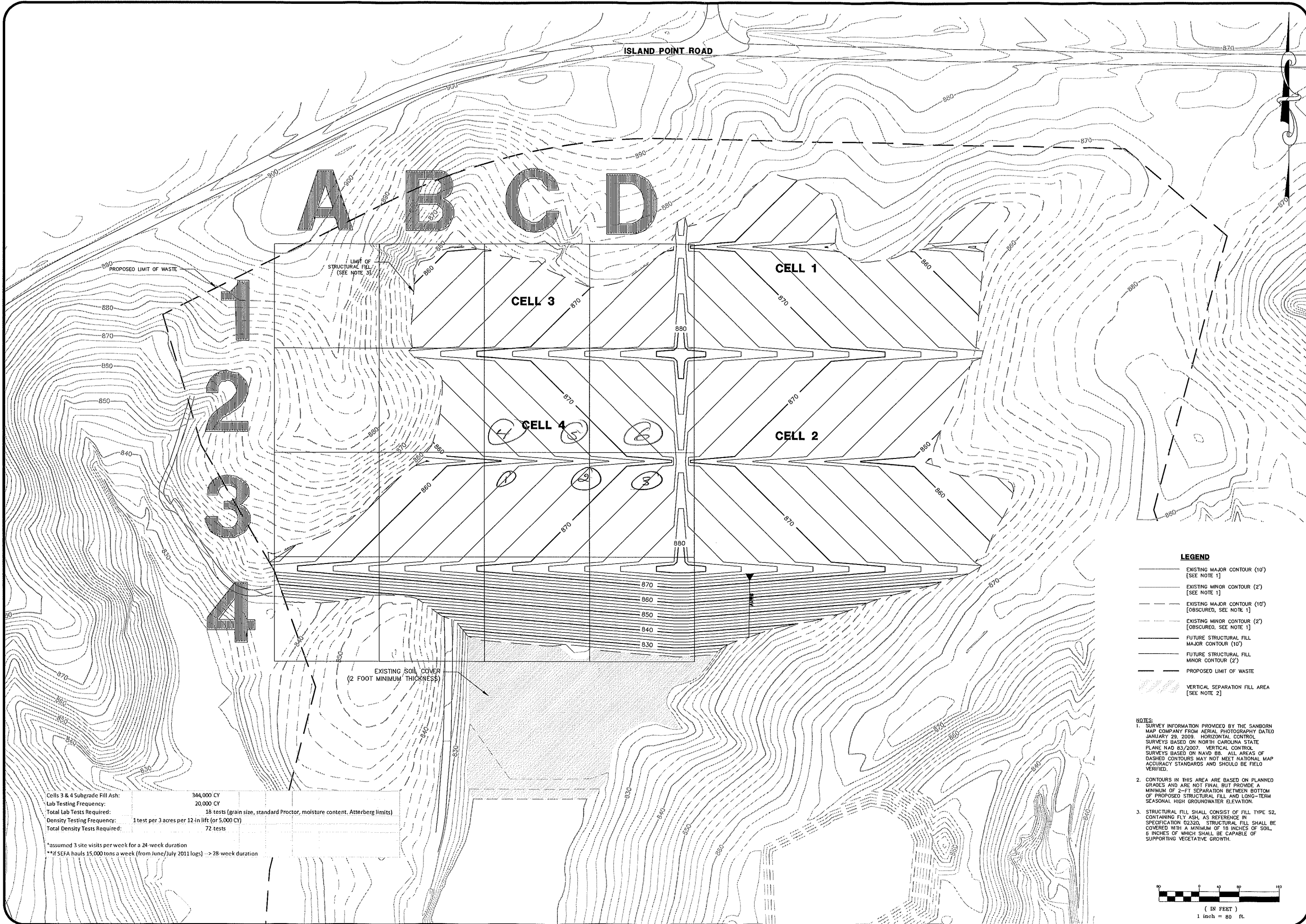
Some personnel on site as requested to perform FOT's on fill placed and compacted @ cell #4. Ash is being spread from south to north by a D6TXL CAT bulldozer. Compaction is accomplished with a 5,000 gal water tank truck 725 Cate and an ash loaded off-road dump truck. 3- Volvo dump trucks are in operation, delivering ash from Silo "B" to the fill area. 6 FOT's were performed on fill placed. All FOT's met the 95% compaction and the $\pm 5\%$ moisture requirement. A soil (ash) protocol sample was collected and taken back to the lab.

On-Site Representative/Company

S&ME Personnel

FEB 28 2013

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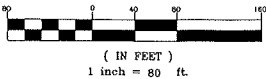
Cells 3 & 4 Subgrade Fill Ash:	344,000 CY
Lab Testing Frequency:	20,000 CY
Total Lab Tests Required:	18 tests (grain size, standard Proctor, moisture content, Atterberg limits)
Density Testing Frequency:	1 test per 3 acres per 12-in lift (or 5,000 CY)
Total Density Tests Required:	72 tests

*assumed 3 site visits per week for a 24-week duration
**if SEFA hauls 15,000 tons a week (from June/July 2011 logs) -> 28-week duration

LEGEND

- EXISTING MAJOR CONTOUR (10') [SEE NOTE 1]
- EXISTING MINOR CONTOUR (2') [SEE NOTE 1]
- EXISTING MAJOR CONTOUR (10') [OBSOURED, SEE NOTE 1]
- EXISTING MINOR CONTOUR (2') [OBSOURED, SEE NOTE 1]
- FUTURE STRUCTURAL FILL MAJOR CONTOUR (10')
- FUTURE STRUCTURAL FILL MINOR CONTOUR (2')
- PROPOSED LIMIT OF WASTE
- VERTICAL SEPARATION FILL AREA [SEE NOTE 2]

- NOTES:
- SURVEY INFORMATION PROVIDED BY THE SANBORN MAP COMPANY FROM AERIAL PHOTOGRAPHY DATED JANUARY 29, 2009. HORIZONTAL CONTROL SURVEYS BASED ON NORTH CAROLINA STATE PLANE NAD 83/2007 VERTICAL CONTROL SURVEYS BASED ON NAVD 88. ALL AREAS OF DASHED CONTOURS MAY NOT MEET NATIONAL MAP ACCURACY STANDARDS AND SHOULD BE FIELD VERIFIED.
 - CONTOURS IN THIS AREA ARE BASED ON PLANNED GRADES AND ARE NOT FINAL BUT PROVIDE A MINIMUM OF 2-FT SEPARATION BETWEEN BOTTOM OF PROPOSED STRUCTURAL FILL AND LONG-TERM SEASONAL HIGH GROUNDWATER ELEVATION.
 - STRUCTURAL FILL SHALL CONSIST OF FILL TYPE S2, CONTAINING FLY ASH, AS REFERENCE IN SPECIFICATION 02320. STRUCTURAL FILL SHALL BE COVERED WITH A MINIMUM OF 18 INCHES OF SOIL, 6 INCHES OF WHICH SHALL BE CAPABLE OF SUPPORTING VEGETATIVE GROWTH.



ENGINEERING LICENSE NO. F-0176

ORIGINAL DRAWING
SIGNED AND SEALED
BY
KENNETH R. DALY
NC SEAL 022163
MAY 25, 2009

NO.	DATE	DESCRIPTION	BY

PHASE 1 STRUCTURAL FILL
STRUCTURAL FILL NOTIFICATION

DUKE ENERGY MARSHALL STEAM STATION
TERRELL, NORTH CAROLINA

DRAWN BY:	C.L.D.	CHECKED BY:	KRO
DESIGNED BY:	WMH	APPROVED BY:	KRO
PROJECT NUMBER	1356-08-122	SCALE:	1" = 80'
DATE:	5-29-09	DRAWING:	3
OF:	3		



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Charlotte, NC 28273
(704) 523-4726
(704) 525-3953 fax

Field Report

To: File

Services Performed

- | | |
|---|--|
| <input type="checkbox"/> Concrete Testing | <input type="checkbox"/> Asphalt Coring |
| <input type="checkbox"/> Cylinder Pickup | <input type="checkbox"/> Concrete Coring |
| <input type="checkbox"/> Asphalt Testing | <input type="checkbox"/> Undercut Evaluation |
| <input type="checkbox"/> Steel Testing | <input type="checkbox"/> Foundation Evaluation |
| | <input type="checkbox"/> Proofrolling |
| | <input checked="" type="checkbox"/> In-Place Density |
| <input type="checkbox"/> Other (Explain) | |

Date <u>3-15-13</u>	Job No. <u>PHASE 3</u> <u>1356-11-032</u>
Project/Location <u>MARSHALL STEAM STATION - INDUSTRIAL LANDFILL</u>	
Contractor <u>SEPA</u>	Weather/Temp <u>Sunny / 50's</u>
Present at Site <u>EARL - S&ME</u> <u>RONNIE - SEPA</u>	
Time <u>8.5</u> ✓	Mileage <u>80.0</u> ✓

Observations/Remarks:

Some personnel on site to perform POT'S on fill placed and compacted @ cell 4. 6 POT'S were performed on fill placed. All POT'S met the 95% compaction requirement and the ± 5 moisture requirement. Tests were performed on ash placed on 3-14-13. SEPA not placing ash today due to a power outage, per Ronnie of SEPA. An ASH protection sample, SG-16, was collected and taken back to the lab.

On-Site Representative/Company

S&ME Personnel

MAR 18 2013

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Field Report

Date 4-30-13	Job No. 03 1356-11-032
Project/Location MARSHALL STEAM STATION Industrial Canal	
Contractor CHARAH	Weather/Temp cloudy/60's
Present at Site Wesley - CHARAH LAMIS Lami - S&ME	
Time 5.0	Mileage 80.0

Services Performed

- | | |
|---|--|
| <input type="checkbox"/> Concrete Testing | <input type="checkbox"/> Asphalt Coring |
| <input type="checkbox"/> Cylinder Pickup | <input type="checkbox"/> Concrete Coring |
| <input type="checkbox"/> Asphalt Testing | <input type="checkbox"/> Undercut Evaluation |
| <input type="checkbox"/> Steel Testing | <input type="checkbox"/> Foundation Evaluation |
| | <input type="checkbox"/> Proofrolling |
| | <input checked="" type="checkbox"/> In-Place Density |
| <input type="checkbox"/> Other (Explain) | |

To: File

Observations/Remarks:

Some personnel on site to perform FOT's on fill placed and compacted @ landfill. 2 FOT's were performed on fill placed. BOTH FOT's failed to meet the 95% compaction and the 15% moisture requirement. CHARAH informed some personnel that they could not get any water today. Wesley, of CHARAH was made aware of the failures.

On-Site Representative/Company

S&ME Personnel

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FIELD REPORT

Date:

05/13/13

Job No.:

1356-11-032-03

Project/Location:

Marshall Industrial LF No. 1 Cells 3 & 4 / Terrell, NC

Contractor:

Charah

Weather/Temperature:

sunny / 70s

Present at Site:

Kyle Baucom & Jason Reeves, S&ME, Inc.; Darrell Wolfe, George Tolbert, Sherrie Christopher, Duke; Walter Fox, Charah

Time:

10:00 AM - 12:30 PM

Mileage:

80 miles

Services Performed

- | | |
|---|--|
| <input type="checkbox"/> Concrete Testing | <input type="checkbox"/> Asphalt Coring |
| <input type="checkbox"/> Cylinder Pickup | <input type="checkbox"/> Concrete Coring |
| <input type="checkbox"/> Asphalt Testing | <input type="checkbox"/> Undercut Evaluation |
| <input type="checkbox"/> Steel Testing | <input type="checkbox"/> Foundation Evaluation |
| | <input type="checkbox"/> Proofrolling |
| | <input type="checkbox"/> In-Place Density |

☒ Other (Explain)

Site observation

To: File

Observations/Remarks:

S&ME representatives on-site at 10:00 AM. Drove to Cells 1 and 2 to observe the chimney drains. Charah was grading around the chimney drains. Walter Fox explained that Charah had clipped the face of the bottom ash from around the chimney drains. He also explained there were 3 chimney drains that seemed to be functioning properly, while there were 3 chimney drains that seemed to drain slowly. The 3 chimney drain locations function properly are the most upstream chimney drain in Cell 1 (CD-1), most upstream chimney drain in Cell 2 (CD-2) and the chimney drain near the Cell 2 sump (CD-3). The 3 chimney drain locations that drained more slowly are the chimney drain at the Cell 1 sump (CD-4), at the middle of Cell 1 (CD-5), and at the middle of Cell 2 (CD-6). Sherrie Christopher also explained that she had noticed issues with the pumps for the LCS and LDS. Kyle Baucom explained that S&ME would collect a bulk sample of bottom ash to perform a grain-size analysis on the material.

Parties drove to Cell 3 and 4 structural fill subgrade to observe construction progress. Walter Fox explained that Charah uploaded the most recent drawing into their GPS unit for the equipment, and it appeared that the subgrade was overbuilt by up to 3 feet in some spots. Kyle Baucom explained that the required tolerance per the specifications was + or - 3 inches. Walter Fox explained that Charah would stop hauling silo ash to the Cell 3 and 4 structural fill subgrade, and begin balancing the cut/fill in this area. He explained that he believed overall the cut and fill would balance out. Kyle Baucom explained that it appeared that there is some fill needed along the western side to bring the fill up to grade. He explained that the intent at the end of ash placement is to cut a ditch into the soil cut slope and maintain a 1 percent sloped ditch to drain to the southwestern corner. Walter Fox explained that Charah would compare the existing grade to the plan to see how much additional fill is needed along this western ditch.

Following the discussion, S&ME representatives drove to the Cell 1 and 2 control panel areas to test the pumps. The LCS low flow pumps for Cell 1 and 2 were both pumping at the time of the observation. The Cell 1 LCS high flow pump, Cell 1 LDS low flow pump, and Cell 2 LDS low flow pumps functioned properly when manually turned on. The audible alarms also worked for each control panel. The Cell 2 high flow pump did not pump when manually turned on. The liquid level was approximately 8 inches. Kyle Baucom explained that it is likely that the Cell 2 high flow pump is higher than the 8-inch liquid level. He explained that during Cell 1 and 2 construction, there was a high flow pump that was caught on the 18-inch diameter riser pipe bend at the 3H:1V side slope and the cell floor. He explained that this pump should be monitored to verify that it operates at higher liquid levels.

Following testing of the pumps, S&ME representatives drove to Cell 2 to collect a sample of bottom ash from chimney drain CD-6 (see chimney drain location descriptions above). S&ME representatives then observed each chimney drain. CD-4, CD-5, and CD-6 appeared to have a layer of caked fines over the bottom ash material and watermarks were apparent. The bottom ash behind the exterior layer of caked fines at CD-4 and CD-5 appeared to contain a significant amount of fines. The bottom ash behind the exterior layer of caked fines at CD-6 appeared to contain less fines. A sample of this bottom ash was collected for grain-size analysis. CD-1 and CD-2 appeared to have coarser bottom ash material. CD-3 appeared to have bottom ash with a significant amount of fines similar to CD-4 and CD-5.

S&ME representatives left the site at 12:30 PM.

Kyle Baucom

On-Site Representative/Company

S&ME Personnel

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FIELD REPORT

Date:

5/13/13

Job No.:

1356-11-032

Project/Location:

Marshall Steam Station

Contractor:

Charah

Weather/Temperature:

60's

Present at Site:

George Tolbert, Sherrie Christopher, , Darrell Wolfe- Duke

Walter Fox, Chris Allen - Charah

Jason Reeves, Kyle Baucom - S&ME

Time:

9 am – 2:30 pm

Mileage:

Services Performed

- | | |
|---|--|
| <input type="checkbox"/> Concrete Testing | <input type="checkbox"/> Asphalt Coring |
| <input type="checkbox"/> Cylinder Pickup | <input type="checkbox"/> Concrete Coring |
| <input type="checkbox"/> Asphalt Testing | <input type="checkbox"/> Undercut Evaluation |
| <input type="checkbox"/> Steel Testing | <input type="checkbox"/> Foundation Evaluation |
| | <input type="checkbox"/> Proofrolling |
| | <input type="checkbox"/> In-Place Density |

☐ Other (Explain)

To: File

Observations/Remarks:

S&ME engineers visited the site as requested by Duke Energy to observe the existing chimney drains at the Marshall Cells 1 and 2 ash landfill. Upon arrival at the site, the following were observed and discussed:

- 1) The Cells 3 and 4 area was observed. The grades were determined to be too high in several areas from the subgrade grading plan due to not previously having GPS ground control in place. Charah will work to regrade the ash to within the project grading tolerances.
- 2) Erosion was occurring along the western of the Cells 3 and 4 area. It was discussed that the drainage ditch should be constructed in residual soil. Erosion of the ash is occurring along this area. It was discussed that slope protection may be required to convey stormwater flows toward the ditch to help reduced erosion in the southwestern portion of the subgrade area where gully erosion has occurred. Once Charah completes the subgrade grading, Duke will contact S&ME for another site visit.
- 3) The power line re-alignment area to the west of Cells 3 and 4 was observed to be under construction.
- 4) The Cells 1 and 2 pumps were discussed. One based on a conversation with Sherrie Christopher of Duke, one of the high flow pumps did not appear to be working. The low flow and high flow pumps were manually operated and appeared to be working with the exception of the Cell 1 high flow pump. It is possible that the head in the high flow sump is not adequate to activate the pump. Kyle Baucom will discuss this with Sherrie Christopher of Duke.
- 4) The chimney drains for Cell 1 and Cell 2 were observed. According to Chris Allen of Charah, 3 of the chimney drains are draining slowly over a period of about 2 days, while the rest of the drains appeared to be performing well.

Kyle Baucom and Jason Reeves of S&ME observed the slowly draining chimney drains and the ones that appeared to be performing well. It appears that a layer of caked fly ash was present in the poorly performing chimney drains. The outer bottom ash material also appeared to contain a significant amount of fines (in some areas 50 percent or more fines). We recommend that the fly ash cake and bottom ash with more significant fines be removed and replaced with cleaner, granular bottom ash without a significant amount of fines (less than 10 percent fines).

Jason S. Reeves

On-Site Representative/Company

S&ME Personnel

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Field Report

To: PL

Services Performed	
<input type="checkbox"/> Concrete Testing	<input type="checkbox"/> Asphalt Coring
<input type="checkbox"/> Cylinder Pickup	<input type="checkbox"/> Concrete Coring
<input type="checkbox"/> Asphalt Testing	<input type="checkbox"/> Undercut Evaluation
<input type="checkbox"/> Steel Testing	<input type="checkbox"/> Foundation Evaluation
	<input type="checkbox"/> Proofrolling
	<input checked="" type="checkbox"/> In-Place Density
<input type="checkbox"/> Other (Explain)	

Date <u>5-17-13</u>	Job No. <u>03</u> <u>1356-11-032</u>
Project/Location <u>MARSHALL STEAMSTATION INDUSTRIAL LANDFILL</u>	
Contractor <u>CHARLHAM</u>	Weather/Temp <u>Sunny / 80's</u>
Present at Site <u>CHAM's</u> <u>MATT</u> <u>RANDY</u> <u>CHAM - same</u>	
Time <u>✓ 9.5</u>	Mileage <u>✓ 80.0</u>

Observations/Remarks:

Some personnel on site to perform POT's on fill placed and compacted @ the ash landfill. Hydration of the ash is accomplished with a 5,000 gal Trivers TA-A25 water truck. Compactions are accomplished with the use of a CAT CS-54 flat roller, and the ash is spread with a CAT D5N LGP bulldozer. 9-POT's were performed on fill placed, which includes several tests that initially failed but ultimately met compaction requirements and $\pm 5\%$ moisture after areas were re-hydrated and re-rolled. All areas met the 95% compaction and the $\pm 5\%$ moisture requirements.

On-Site Representative/Company

S&ME Personnel

MAY 20 2013

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FIELD REPORT

Date:

08/22/13

Job No.:

1356-11-032-06

Project/Location:

Marshall Industrial LF No. 1 Cells 3 & 4 / Terrell, NC

Contractor:

Charah

Weather/Temperature:

sunny / 80s

Present at Site:

Kyle Baucom, S&ME, Inc.; Darrell Wolfe, Duke

Time:

12:30 PM - 2:00 PM

Mileage:

80 miles

Services Performed

- | | |
|---|--|
| <input type="checkbox"/> Concrete Testing | <input type="checkbox"/> Asphalt Coring |
| <input type="checkbox"/> Cylinder Pickup | <input type="checkbox"/> Concrete Coring |
| <input type="checkbox"/> Asphalt Testing | <input type="checkbox"/> Undercut Evaluation |
| <input type="checkbox"/> Steel Testing | <input type="checkbox"/> Foundation Evaluation |
| | <input type="checkbox"/> Proofrolling |
| | <input type="checkbox"/> In-Place Density |

☒ Other (Explain)

Site observation

To: File

Observations/Remarks:

S&ME representative arrived on-site at 12:30 PM. Drove to Cells 3 and 4 to observe the structural fill closure construction. Charah was on their lunch break upon arrival. Met with Darrell Wolfe to discuss construction progress. Based on the construction grid, Charah had placed a 6-inch thick compacted lift of soil in Grids C1, C2, D1, and D2. Soil was being excavated and hauled from Stockpile #5 just to the south of Cells 3 & 4. Soil was being placed in an approximate 8-inch thick loose lift and compacted with a sheepsfoot roller to a 6-inch thick compacted lift. While on-site, Charah's water truck was being utilized for dust control on the haul roads. Based on conversations with Darrell Wolfe with Duke and Jim Williams with Charah, the construction plan is to place a 6-inch thick lift of soil over the Cells 3 and 4 area, followed by an additional 6-inch thick lift of soil to achieve the 12 inches of structural fill soil cover, and then follow with a 6-inch thick lift of topsoil. Charah has continued to maintain E&SC measures from recent rains.

Following observations at Cells 3 & 4, the S&ME representative drove with Darrell Wolfe to observe erosion issues occurring adjacent to the northern perimeter road that was installed as part of the transmission line relocation project. Driving to the west on the perimeter road, there were 2 roadside channels on the left side of the road that were eroded. Darrell Wolfe explained that the channels had been seeded and check dams had been installed following construction, but erosion had continued to occur in the channel. There was a similar channel to the right of the perimeter road. This channel had also been seeded and erosion control matting and check dams had been installed in the channel. However, erosion has continued to occur. Suggested that 18 inches of Class B riprap underlain by an 8 oz/sy nonwoven geotextile would be a permanent stabilization alternative since vegetation would not establish in the channels. S&ME representative left the site at 2:00 PM.

Kyle Baucom

On-Site Representative/Company

S&ME Personnel

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9751 Southern Pine Blvd
Charlotte, NC 28273
(704) 523-4726
(704) 525-3953 fax

Field Report

To: File

Services Performed

- | | |
|---|--|
| <input type="checkbox"/> Concrete Testing | <input type="checkbox"/> Asphalt Coring |
| <input type="checkbox"/> Cylinder Pickup | <input type="checkbox"/> Concrete Coring |
| <input type="checkbox"/> Asphalt Testing | <input type="checkbox"/> Undercut Evaluation |
| <input type="checkbox"/> Steel Testing | <input type="checkbox"/> Foundation Evaluation |
| | <input type="checkbox"/> Proofrolling |
| | <input checked="" type="checkbox"/> In-Place Density |
| <input type="checkbox"/> Other (Explain) | |

Date <u>8-23-13</u>	Job No. <u>03</u> <u>1356-11-032</u>
Project/Location <u>Cells 3+4</u> <u>MARSHALL INDUSTRIAL LANDFILL No. 1</u>	
Contractor <u>CHARRAH</u>	Weather/Temp <u>Sunny / 80's</u>
Present at Site <u>Jim - CHARRAH - CHRIS</u> <u>EMC - Stone</u>	
Time <u>7.5</u> ✓	Mileage <u>100.0</u> ✓

Observations/Remarks:

Some personnel on site as requested to perform PDI's
on fill placed and compacted @ Cells 3+4. 6-PDI's
were performed on fill placed. All PDI's met the
93% compaction and the $\pm 3\%$ moisture
requirement. A soil moisture sample was collected
and taken back to the lab.

On-Site Representative/Company

Earl J. Alexander

S&ME Personnel

AUG 26 2013

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FIELD REPORT

Date:

08/29/13

Job No.:

1356-11-032-06

Project/Location:

Marshall Industrial LF No. 1 Cells 3 & 4 / Terrell, NC

Contractor:

Charah

Weather/Temperature:

sunny / 80s

Present at Site:

Kyle Baucom, S&ME, Inc.; Darrell Wolfe, Duke;
Jim Williams, Charah

Time:

10:15 AM - 12:00
PM

Mileage:

80 miles

Services Performed

- | | |
|---|--|
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| <input type="checkbox"/> Cylinder Pickup | <input type="checkbox"/> Concrete Coring |
| <input type="checkbox"/> Asphalt Testing | <input type="checkbox"/> Undercut Evaluation |
| <input type="checkbox"/> Steel Testing | <input type="checkbox"/> Foundation Evaluation |
| | <input type="checkbox"/> Proofrolling |
| | <input type="checkbox"/> In-Place Density |

☒ Other (Explain)

Site observation

To: File

Observations/Remarks:

S&ME representative arrived on-site at 10:30 AM. Drove to Cells 3 and 4 to observe the structural fill closure construction. Charah had placed the 2nd 6-inch lift of soil over most of the Cells 3 and 4 area. The northern area had been cleared as shown on the drawings. Charah had excavated out most of the wet ash in the northern area due to ponding of water in this area. The area appeared to be approximately 30 feet wide by about 60 feet long. The S&ME representative drove to Cells 1 and 2 to probe compacted ash to establish a base line probe depth for compacted ash. Under body weight, the probe extended approximately 3 inches into the compacted ash in the landfill. The upper 20-foot wide strip was probed to a depth of 2 to 3 inches over the 60-foot length, so this area appeared to be acceptable. The lower 10-foot wide strip appeared to be softer and have standing water. This material was excavated to a depth of about 1.5 to 2 feet to underlying soil. The wet ash was removed and hauled off. Jim Williams explained that this area would be backfilled with soil.

Based on the area where Charah had cleared and removed topsoil, it appeared that there would be positive drainage from the north end of the area to the start of the western diversion channel. Jim Williams explained that Charah plans to be finished with the project during the week of September 16-20. S&ME representative left the site at 12:00 PM.

Kyle Baucom

On-Site Representative/Company

S&ME Personnel

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Field Report

To: file

Services Performed	
<input type="checkbox"/> Concrete Testing	<input type="checkbox"/> Asphalt Coring
<input type="checkbox"/> Cylinder Pickup	<input type="checkbox"/> Concrete Coring
<input type="checkbox"/> Asphalt Testing	<input type="checkbox"/> Undercut Evaluation
<input type="checkbox"/> Steel Testing	<input type="checkbox"/> Foundation Evaluation
	<input type="checkbox"/> Proofrolling
	<input checked="" type="checkbox"/> In-Place Density
<input type="checkbox"/> Other (Explain)	

Date <u>8-30-13</u>	Job No. <u>1356-11-032</u> <u>cells 3+4</u>
Project/Location <u>Marginal Industrial Landfill No 1</u>	
Contractor	Weather/Temp <u>Sunny 180's</u>
Present at Site <u>Tin</u> <u>JAY - CHARRAH</u> <u>RMC - S&ME</u>	
Time <u>8.5</u> ✓	Mileage <u>100</u> ✓

Observations/Remarks:

S&ME personnel on site to perform FDT's and soil
placed and compacted @ No 1 landfill cells 3+4.
9-FDT's were performed. All FDT's met the
95% compaction and the $\pm 3\%$ moisture
requirement.

On-Site Representative/Company

Earl J. Clepper
S&ME Personnel

SEP 3 2013

Disclaimer: The presence of S&ME at the project site shall not be construed as an acceptance or approval of activities at the site. S&ME is at the project site to perform specific services and has certain responsibilities which are limited to those specifically authorized in our agreement with our client. In no event shall S&ME be responsible for the safety or the means and methods of other parties at the project site. **The information presented in this field report has not been reviewed by an engineer and is to be considered preliminary.**



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Field Report

To: File

Services Performed

- | | |
|---|--|
| <input type="checkbox"/> Concrete Testing | <input type="checkbox"/> Asphalt Coring |
| <input type="checkbox"/> Cylinder Pickup | <input type="checkbox"/> Concrete Coring |
| <input type="checkbox"/> Asphalt Testing | <input type="checkbox"/> Undercut Evaluation |
| <input type="checkbox"/> Steel Testing | <input type="checkbox"/> Foundation Evaluation |
| | <input type="checkbox"/> Proofrolling |
| | <input checked="" type="checkbox"/> In-Place Density |

☐ Other (Explain)

Date

9-3-13

Job No.

1352-11-032⁰³

Project/Location

MANHALL INDUSTRIAL LANDFILL
No. 1 - Cells 3+4

Contractor

CHARRAH

Weather/Temp

Sunny/80s

Present at Site

DONNY - CHARRAH
JAY - CHARRAH

EARL - S&ME

Time

7.0

Mileage

100.0

Observations/Remarks:

S&ME personnel on site to perform POT's on fill placed and compacted @ the landfill cells - 3+4. 6 POT's were performed on fill placed. 6 POT's were performed on fill placed. Cell POT's met the 95% compaction and the $\pm 3\%$ moisture requirement.

On-Site Representative/Company

S&ME Personnel SEP 4 2013

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**APPENDIX II – PROJECT
DOCUMENTATION
Section 3 – Issued for Construction Drawings**



CELLS 3 AND 4 STRUCTURAL FILL CLOSURE

MARSHALL STEAM STATION INDUSTRIAL LANDFILL NO. 1

ISSUED FOR CONSTRUCTION

DUKE ENERGY - MARSHALL STEAM STATION
TERRELL, NORTH CAROLINA
AUGUST 2013

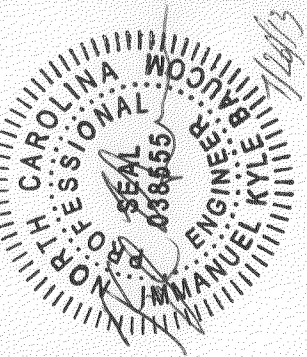


LOCATION / S&ME OFFICE MAP
NOT TO SCALE



SITE VICINITY MAP
NOT TO SCALE

DRAWING	TITLE
C0	COVER SHEET
C1	CELL 3 AND 4 STRUCTURAL FILL EXISTING CONDITIONS / SUBGRADE PLAN
C2	CELL 3 AND 4 STRUCTURAL FILL CLOSURE PLAN
C3	CELL 3 AND 4 STRUCTURAL FILL STORMWATER MANAGEMENT PLAN
C4	CELL 3 AND 4 STRUCTURAL FILL BORROW/STOCKPILE AREA PLAN
D1	CLOSURE & STORMWATER DETAILS 1
D2	CLOSURE & STORMWATER DETAILS 2
D3	E&SC DETAILS 1
D4	E&SC DETAILS 2
D5	E&SC DETAILS 3

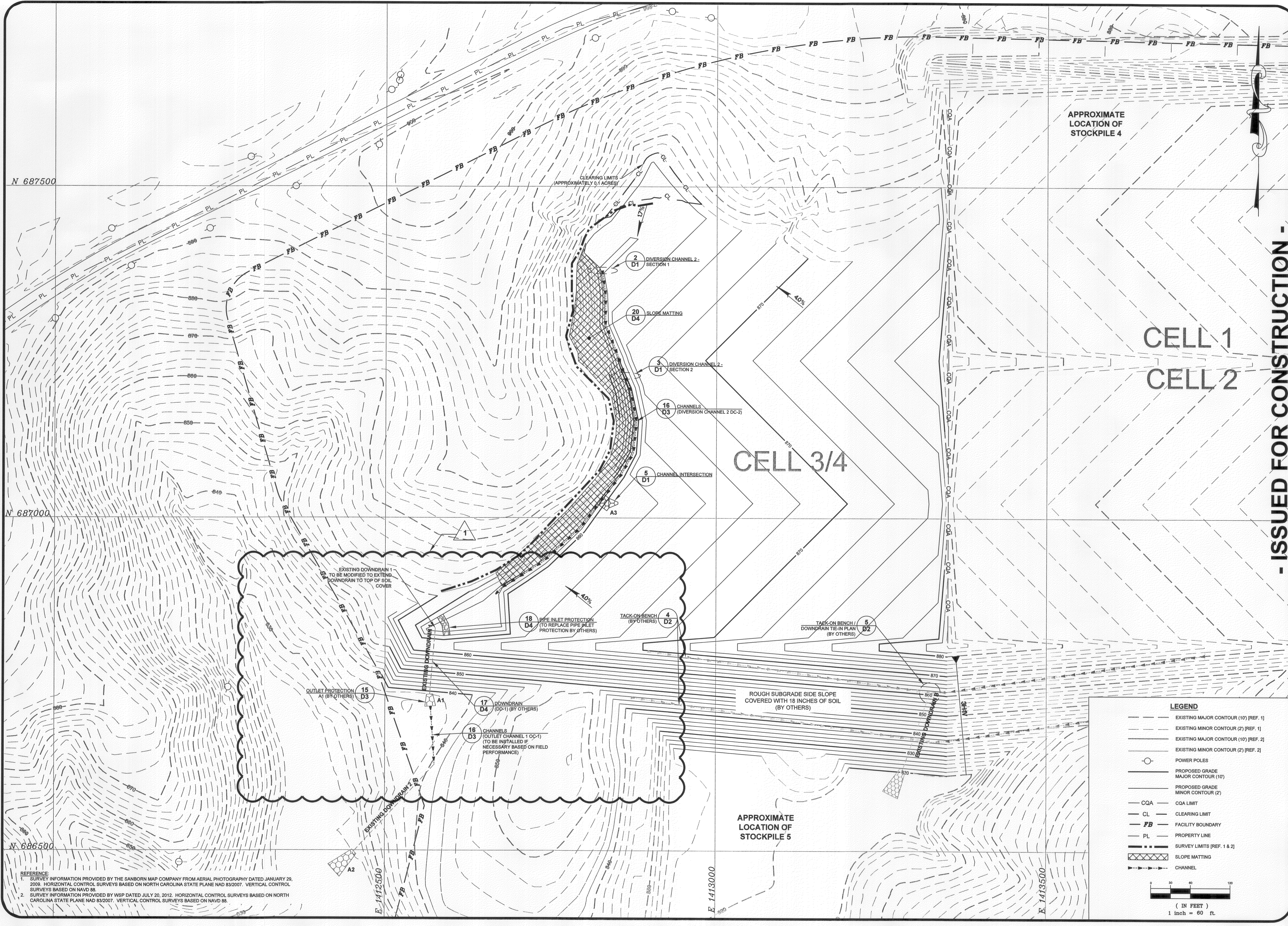


NO.	DATE	DESCRIPTION	BY
1	07/26/13	ISSUED FOR CONSTRUCTION	IKB
2	09/25/13	ADDED DRAWING D5	IKB
3	09/12/13	BID ISSUE	IKB

NO.	DATE	DESCRIPTION	BY
1	07/26/13	ISSUED FOR CONSTRUCTION	IKB
2	09/25/13	ADDED DRAWING D5	IKB
3	09/12/13	BID ISSUE	IKB

COVER SHEET	CELLS 3 AND 4 STRUCTURAL FILL CLOSURE MARSHALL STEAM STATION INDUSTRIAL LANDFILL NO. 1 TERRELL, NORTH CAROLINA
-------------	--

ENGINEERING LICENSE NO. F-0176	DRAWN BY: CLD	CHECKED BY: IKB
DESIGNED BY: IKB	APPROVED BY: JJA/JSR	PROJECT NUMBER 1356-11-032
SCALE: NTS	DATE: 06/12/13	DUKE ENERGY DRAWING NUMBER C0 34 SF
DRAWING: C0	OF: 10	



N 687500

N 687000

N 686500

REFERENCE:
1. SURVEY INFORMATION PROVIDED BY THE SANBORN MAP COMPANY FROM AERIAL PHOTOGRAPHY DATED JANUARY 29, 2009. HORIZONTAL CONTROL SURVEYS BASED ON NORTH CAROLINA STATE PLANE NAD 83/2007. VERTICAL CONTROL SURVEYS BASED ON NAVD 88.
2. SURVEY INFORMATION PROVIDED BY WSP DATED JULY 20, 2012. HORIZONTAL CONTROL SURVEYS BASED ON NORTH CAROLINA STATE PLANE NAD 83/2007. VERTICAL CONTROL SURVEYS BASED ON NAVD 88.

APPROXIMATE
LOCATION OF
STOCKPILE 4

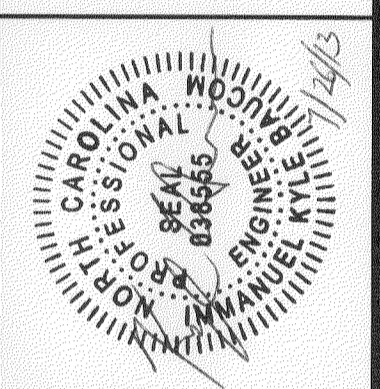
CELL 1
CELL 2

CELL 3/4

APPROXIMATE
LOCATION OF
STOCKPILE 5

- ISSUED FOR CONSTRUCTION -

S&ME
www.smeinc.com
975 SOUTHERN PINE BLVD.
CHASLOT, NC 28733
PH: (704) 233-4725



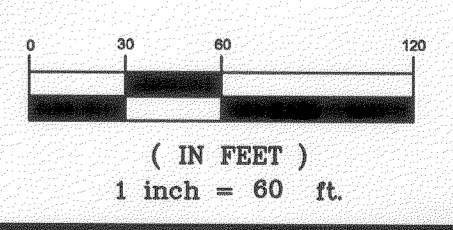
NO.	DATE	DESCRIPTION
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1	06/25/13	CLARIFIED RESPONSIBILITY WITH PIPE INLET PROTECTION AND DOWNDRAIN 1 AND NEED FOR OC-1
0	06/12/13	BID ISSUE

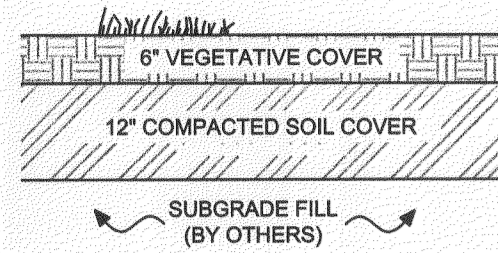
CELLS 3 AND 4 STRUCTURAL FILL STORMWATER MANAGEMENT PLAN
CELLS 3 AND 4 STRUCTURAL FILL CLOSURE
MARSHALL STEAM STATION INDUSTRIAL LANDFILL NO. 1
TERRELL, NORTH CAROLINA

ENGINEERING LICENSE NO.: F-0176	DRAWN BY: CLD	CHECKED BY: IKB
DESIGNED BY: IKB	APPROVED BY: JJAJSR	
PROJECT NUMBER: 1356-11-032	SCALE: NTS	DATE: 06/12/13
DUKE ENERGY DRAWING NUMBER: C3 34 SF	DRAWING: C3	OF: 10

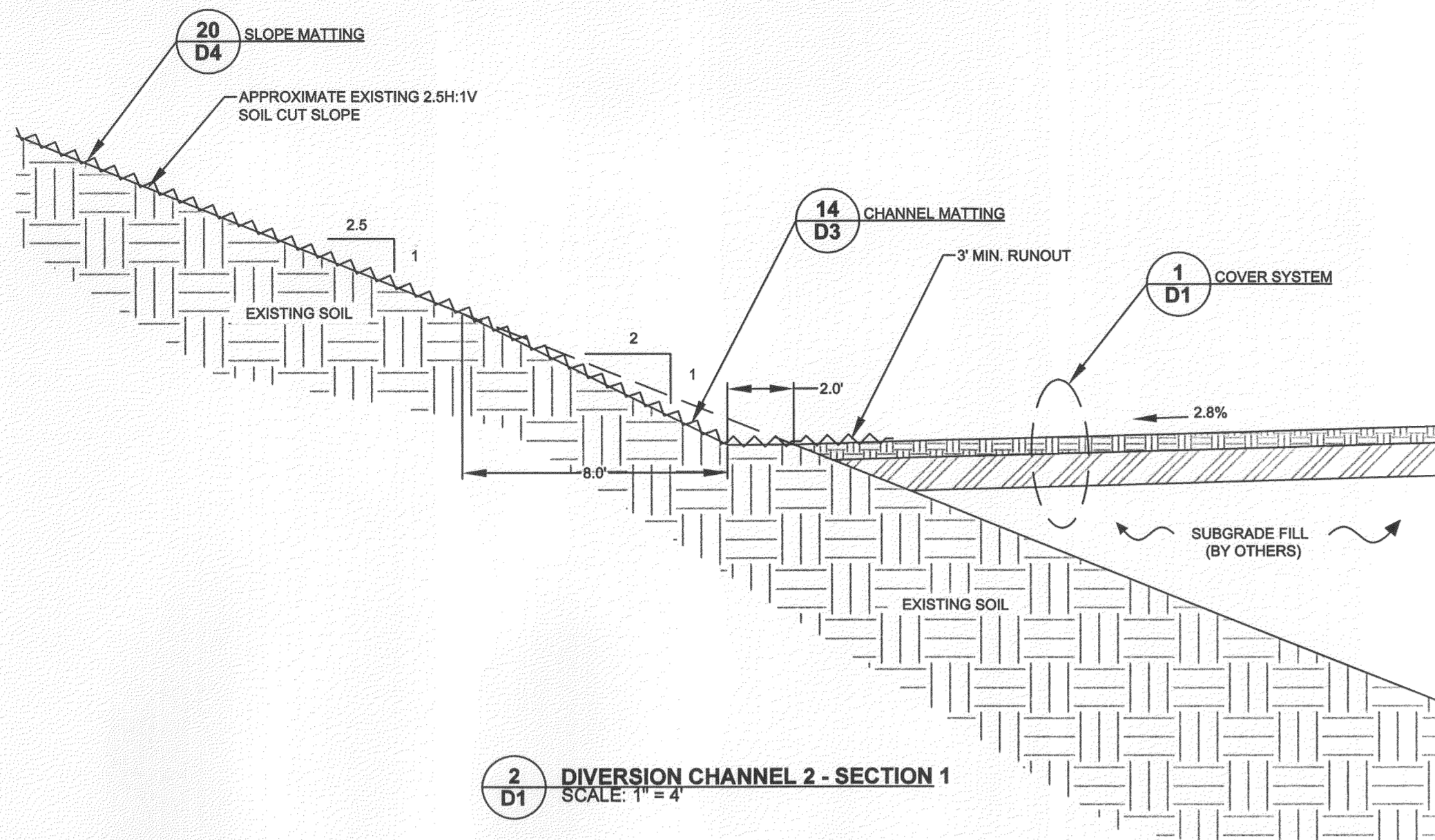
LEGEND

- EXISTING MAJOR CONTOUR (10') (REF. 1)
- EXISTING MINOR CONTOUR (2') (REF. 1)
- EXISTING MAJOR CONTOUR (10') (REF. 2)
- EXISTING MINOR CONTOUR (2') (REF. 2)
- POWER POLES
- PROPOSED GRADE MAJOR CONTOUR (10')
- PROPOSED GRADE MINOR CONTOUR (2')
- CQA LIMIT
- CLEARING LIMIT
- FACILITY BOUNDARY
- PROPERTY LINE
- SURVEY LIMITS (REF. 1 & 2)
- SLOPE MATTING
- CHANNEL

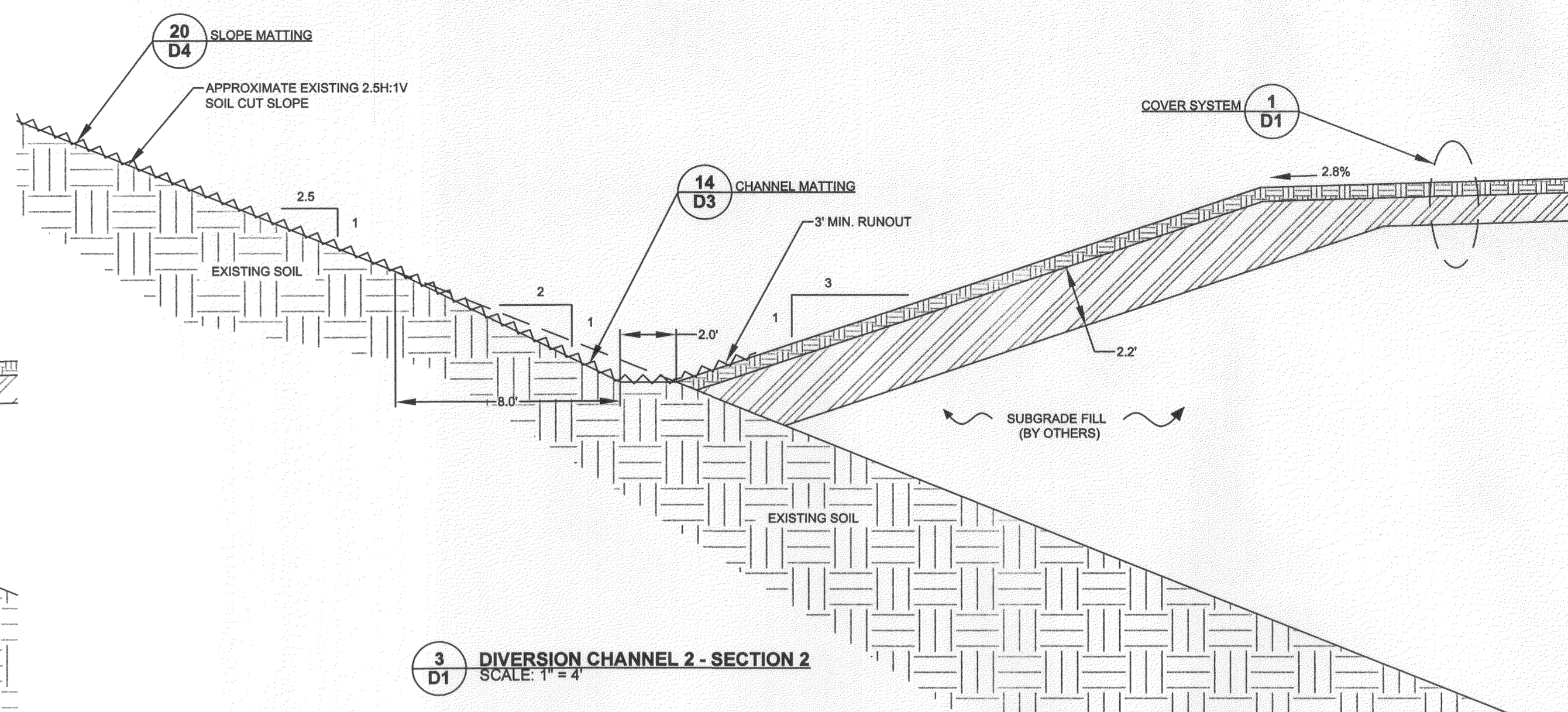




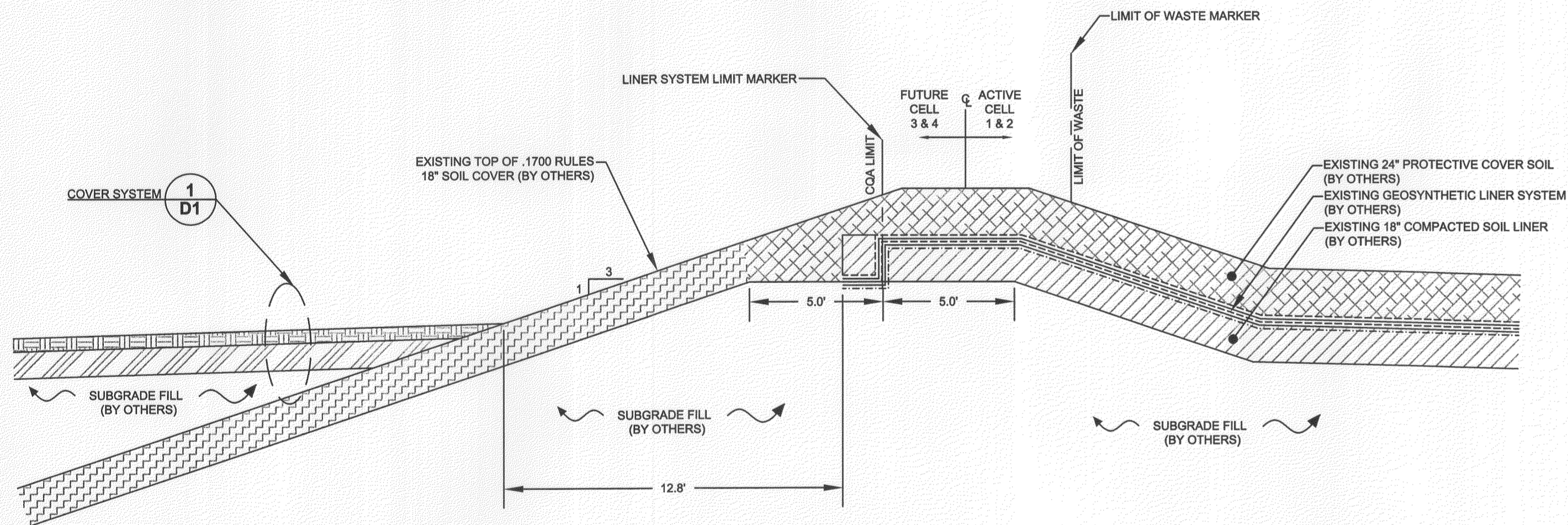
1
D1 COVER SYSTEM
SCALE: 1" = 2'



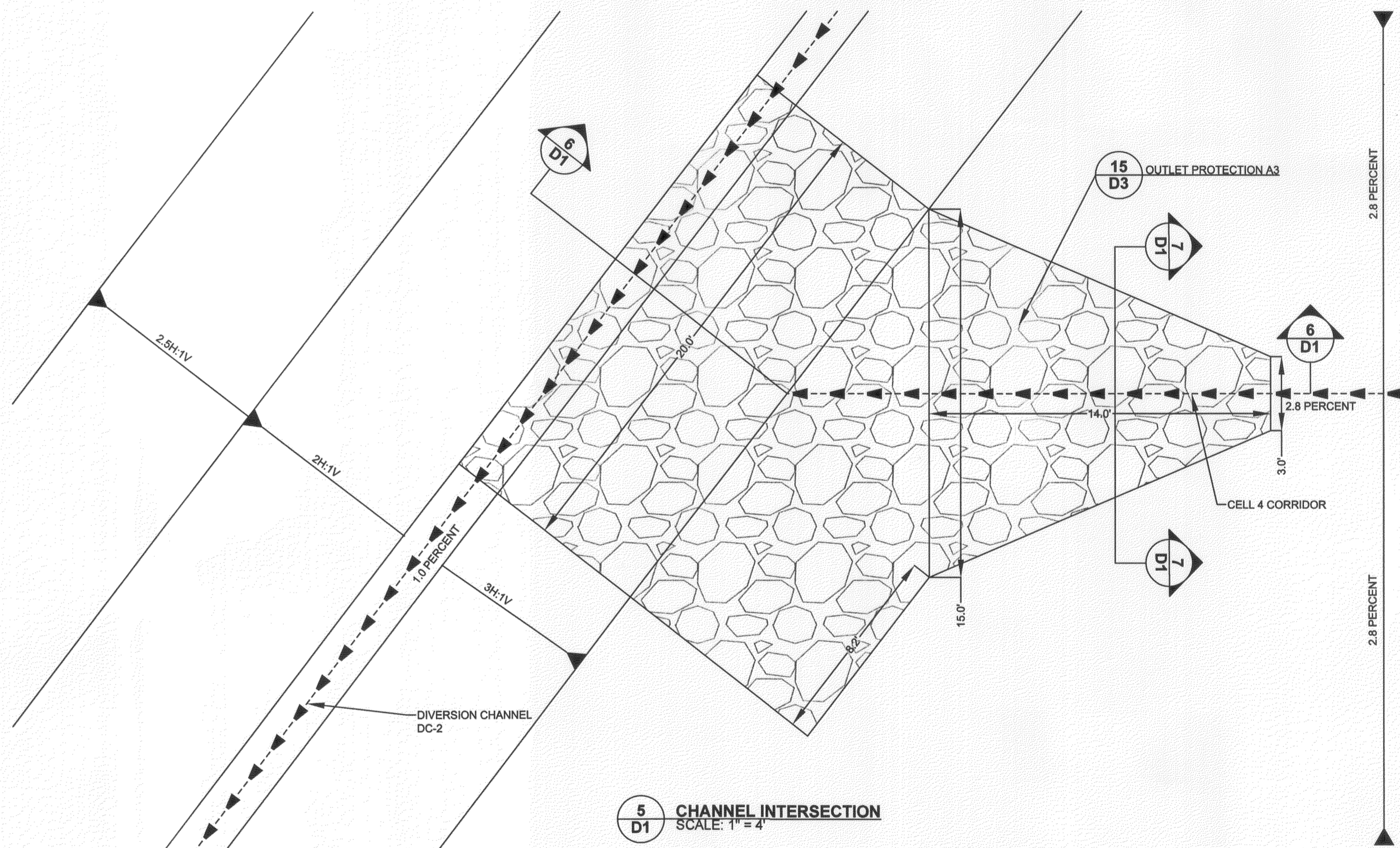
2
D1 DIVERSION CHANNEL 2 - SECTION 1
SCALE: 1" = 4'



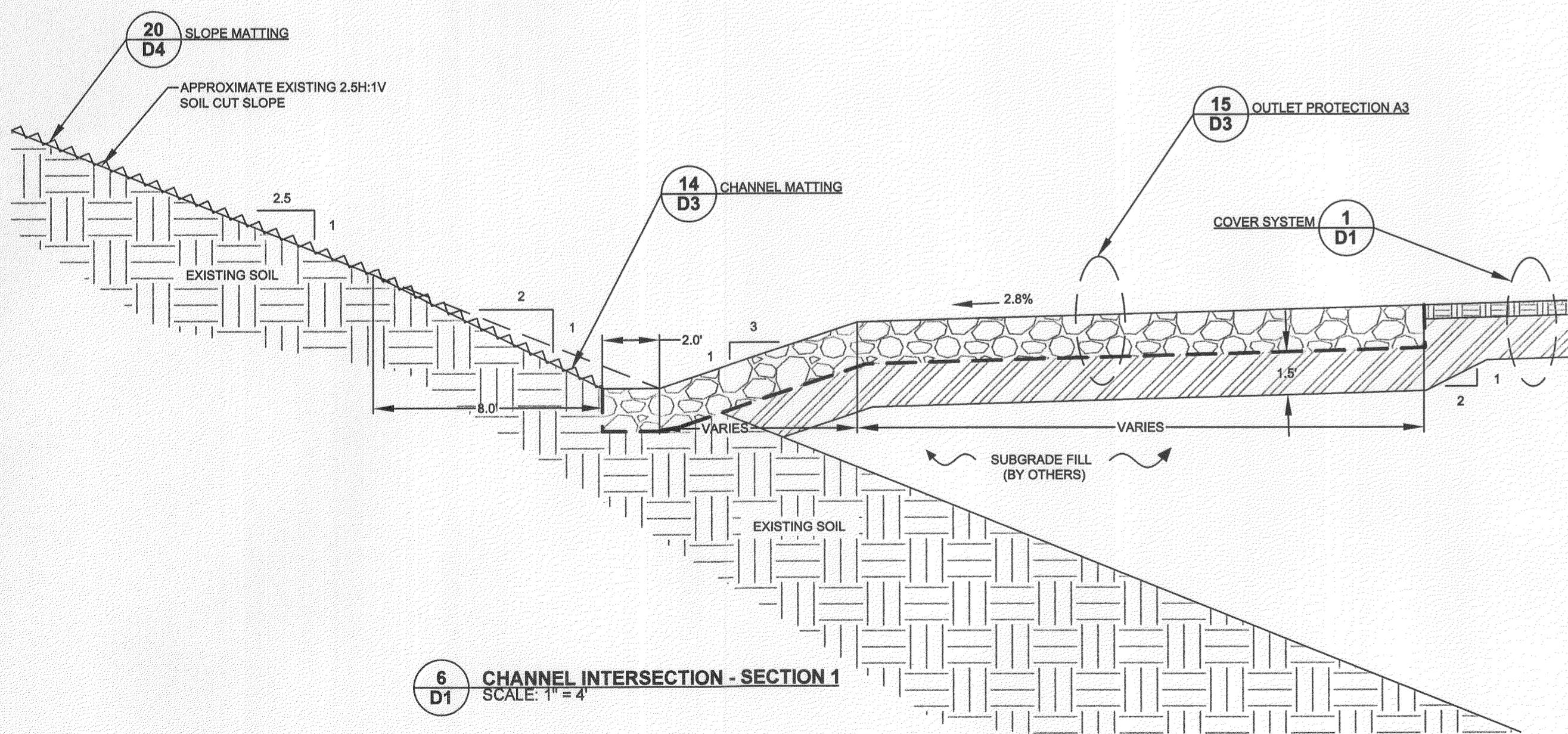
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D1 DIVERSION CHANNEL 2 - SECTION 2
SCALE: 1" = 4'



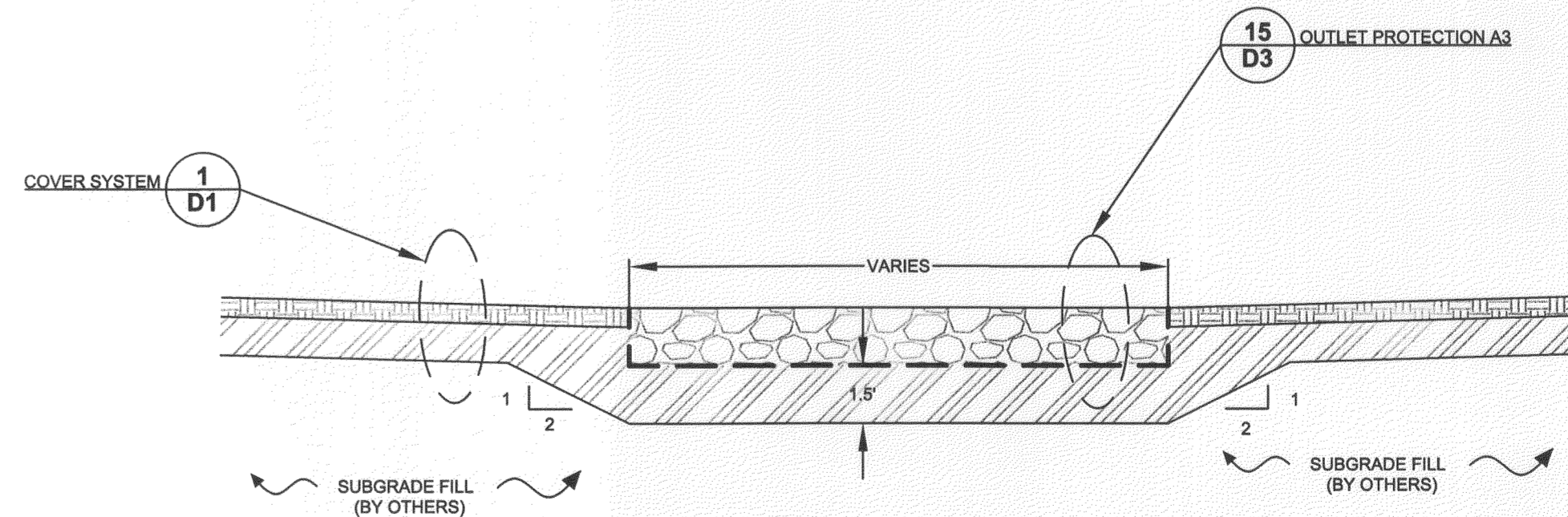
4
D1 INTERCELL BERM
SCALE: 1" = 4'



5
D1 CHANNEL INTERSECTION
SCALE: 1" = 4'

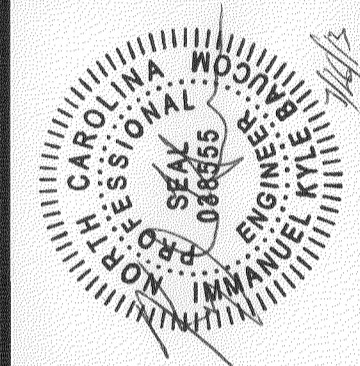


6
D1 CHANNEL INTERSECTION - SECTION 1
SCALE: 1" = 4'



7
D1 CHANNEL INTERSECTION - SECTION 2
SCALE: 1" = 4'

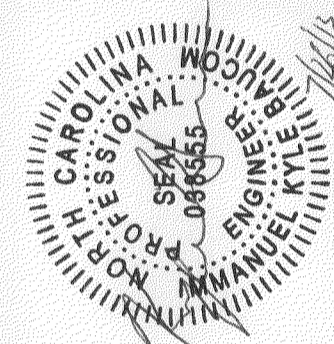
- ISSUED FOR CONSTRUCTION -



NO.	DATE	DESCRIPTION	BY
1	07/26/13	ISSUED FOR CONSTRUCTION	IKB
0	08/12/13	BID ISSUE	IKB

CLOSURE & STORMWATER DETAILS 1	CELLS 3 AND 4 STRUCTURAL FILL CLOSURE MARSHALL STEAM STATION INDUSTRIAL LANDFILL NO. 1 TERRELL, NORTH CAROLINA
--------------------------------	--

ENGINEERING LICENSE NO: F-0178	DRAWN BY: CLD	CHECKED BY: IKB
DESIGNED BY: IKB	APPROVED BY: JJA/JSR	
PROJECT NUMBER 1356-11-032	SCALE: NTS	DATE: 06/12/13
DUKE ENERGY DRAWING NUMBER D1 34 SF	DRAWING: D1	OF: 10

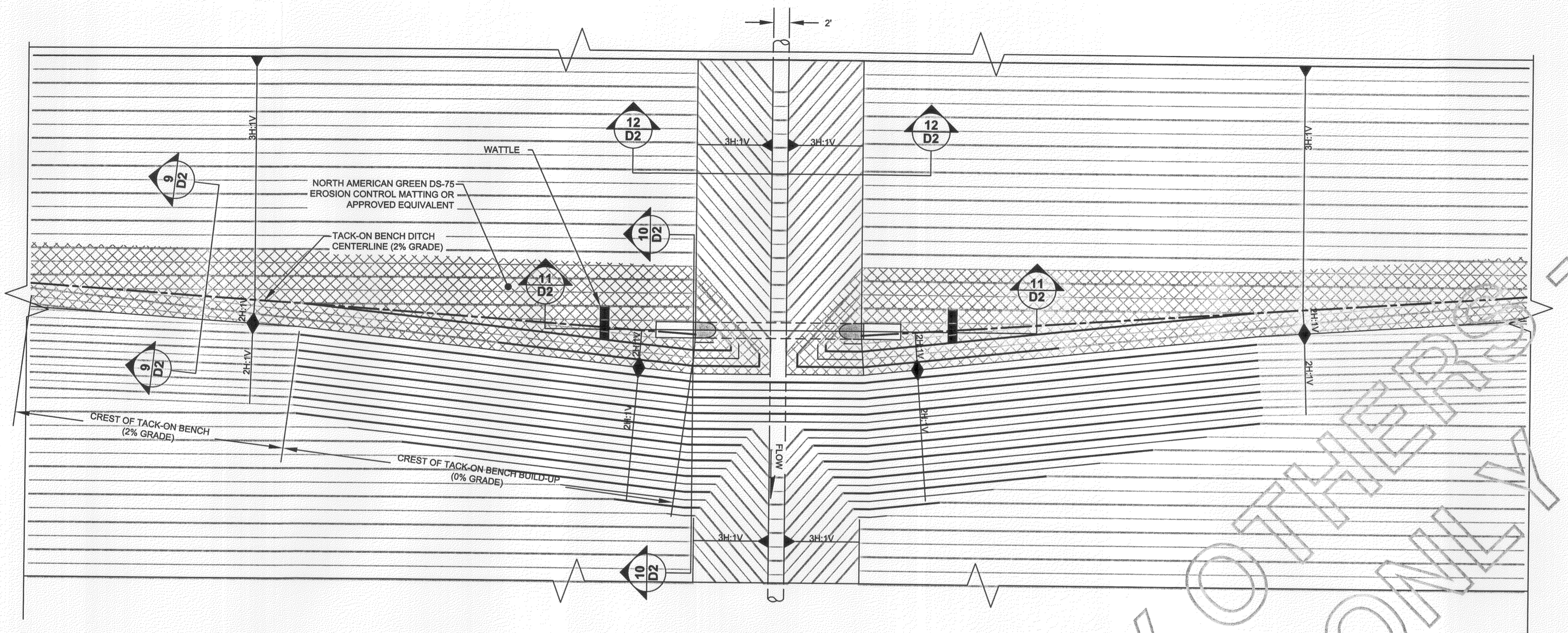


NO.	DATE	DESCRIPTION	BY
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0	06/12/13	BID ISSUE	IKB

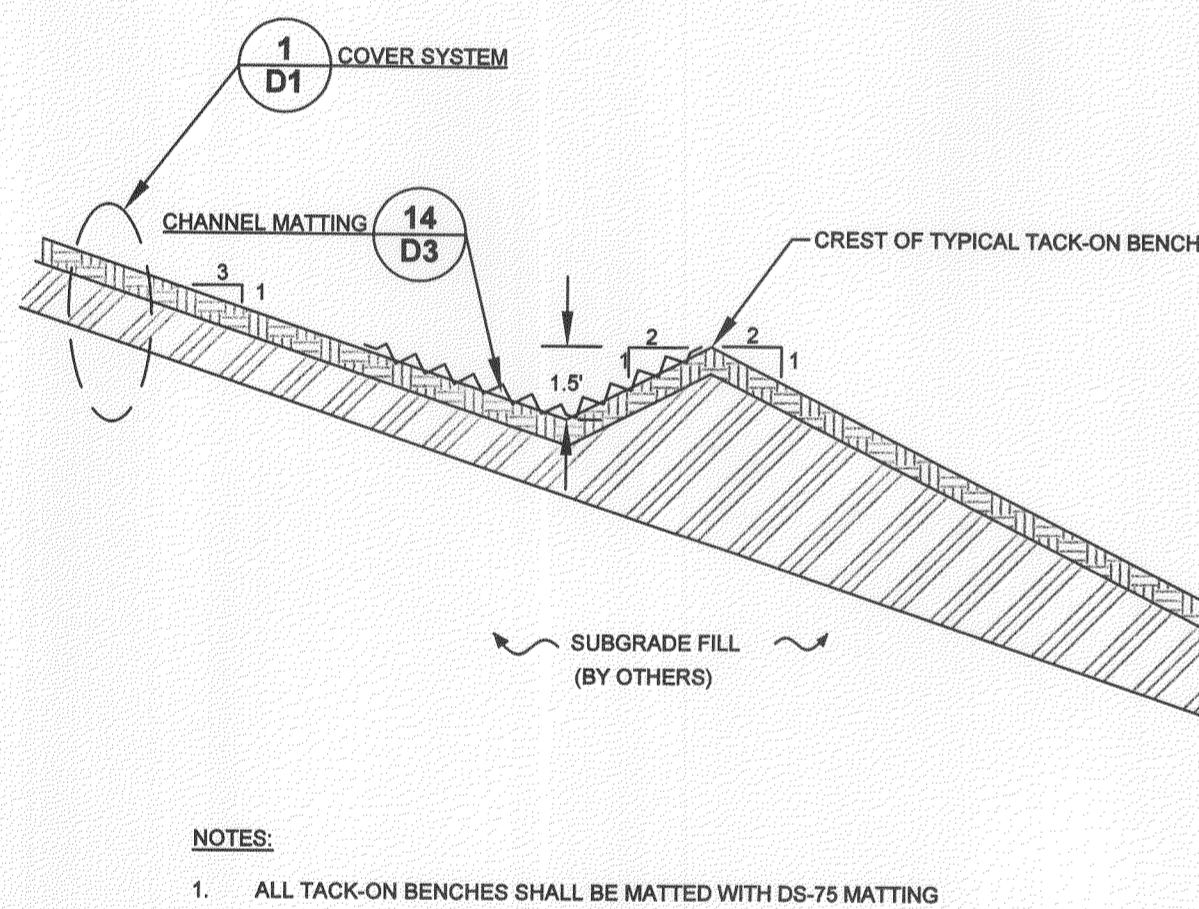
CLOSURE & STORMWATER DETAILS 2
CELLS 3 AND 4 STRUCTURAL FILL CLOSURE
MARSHALL STEAM STATION INDUSTRIAL LANDFILL NO. 1
TERRELL, NORTH CAROLINA

ENGINEERING LICENSE NO.: F-0178
DRAWN BY: CLD
CHECKED BY: IKB
DESIGNED BY: IKB
APPROVED BY: JJA/JSR
PROJECT NUMBER: 1356-11-032
SCALE: NTS
DATE: 06/12/13
DUKE ENERGY DRAWING NUMBER: D2 34 SF
DRAWING: D2
OF: 10

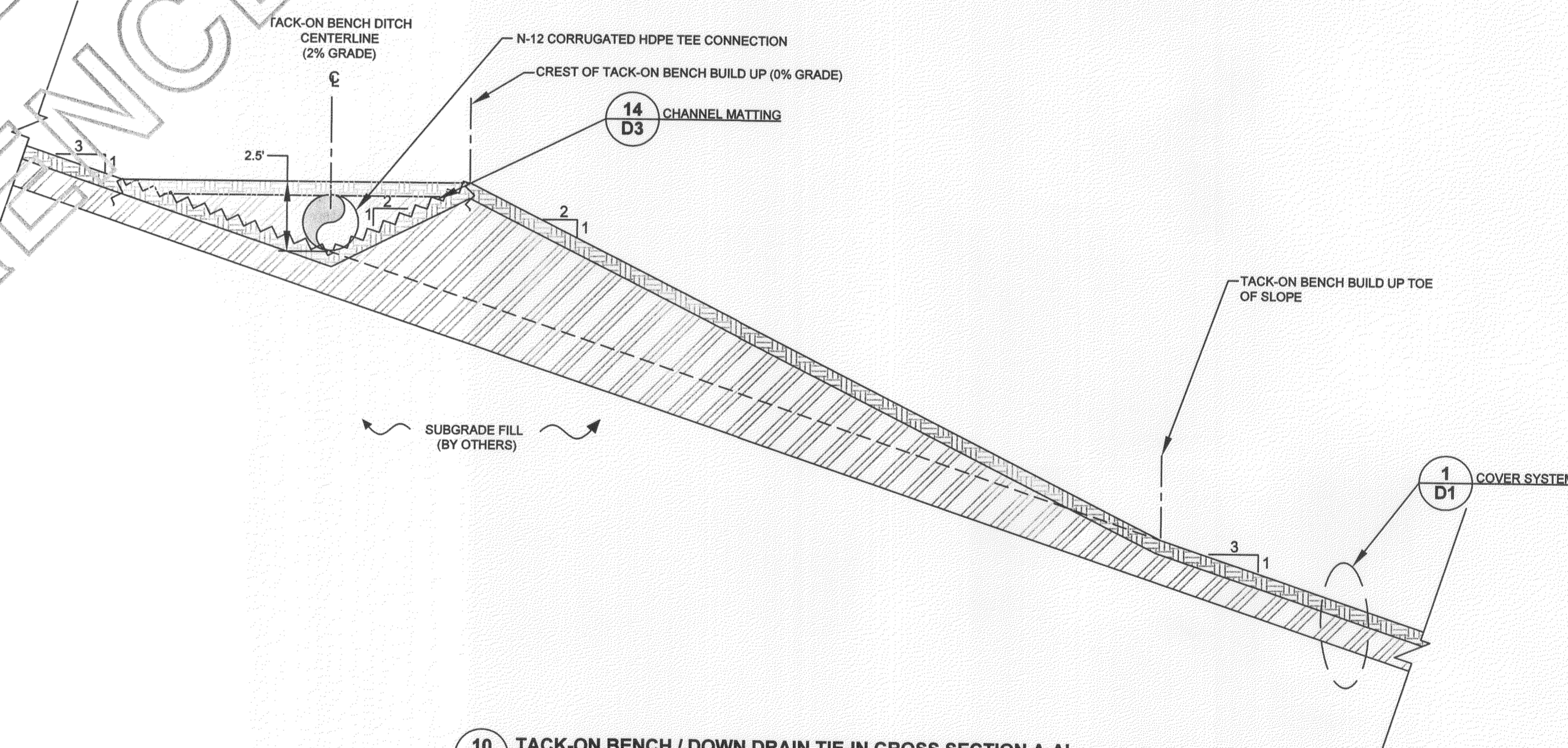
- ISSUED FOR CONSTRUCTION -



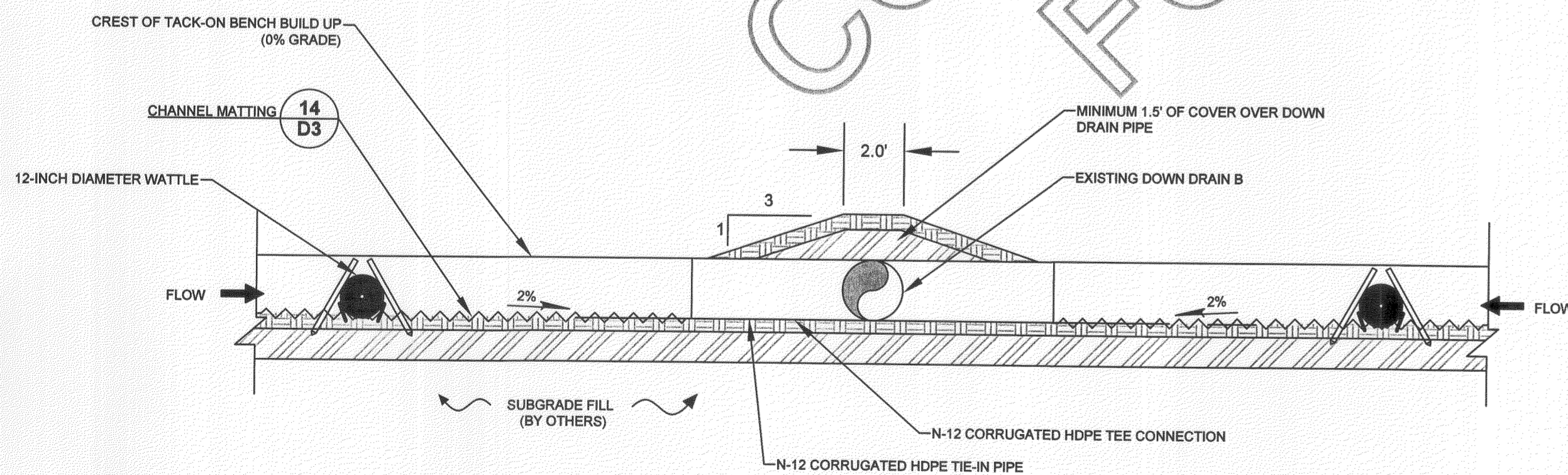
8 TACK-ON BENCH / DOWN DRAIN TIE-IN PLAN
SCALE: 1" = 4'



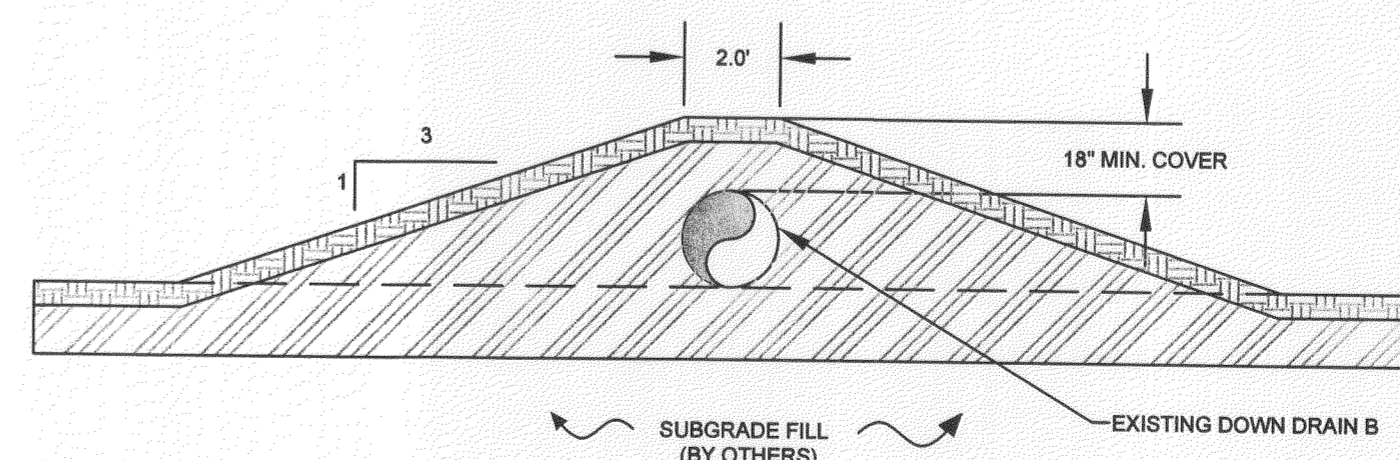
9 TACK-ON BENCH
SCALE: 1" = 4'



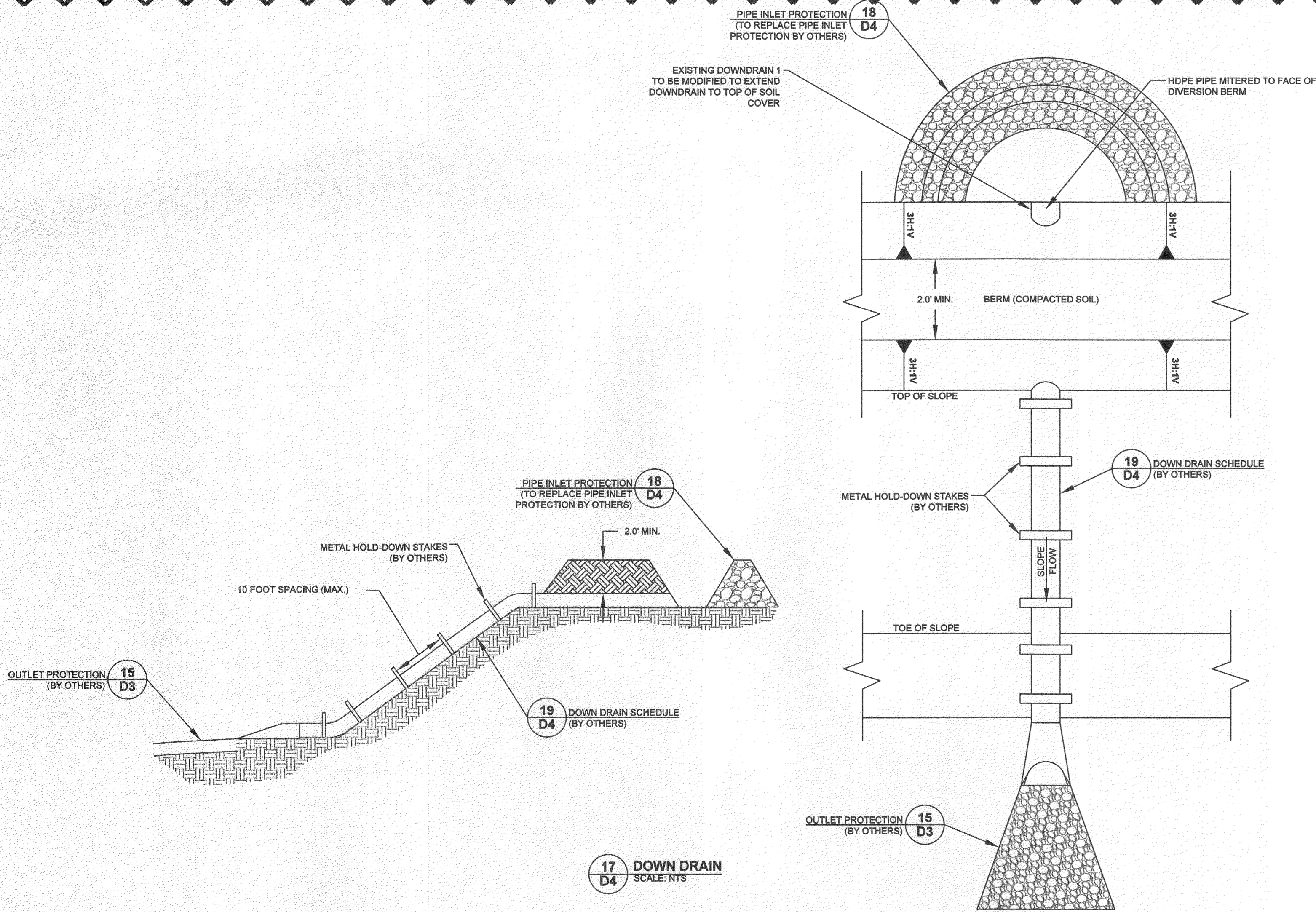
10 TACK-ON BENCH / DOWN DRAIN TIE-IN CROSS SECTION A-A'
SCALE: 1" = 4'



11 TACK-ON BENCH / DOWN DRAIN TIE-IN CROSS SECTION B-B'
SCALE: 1" = 4'

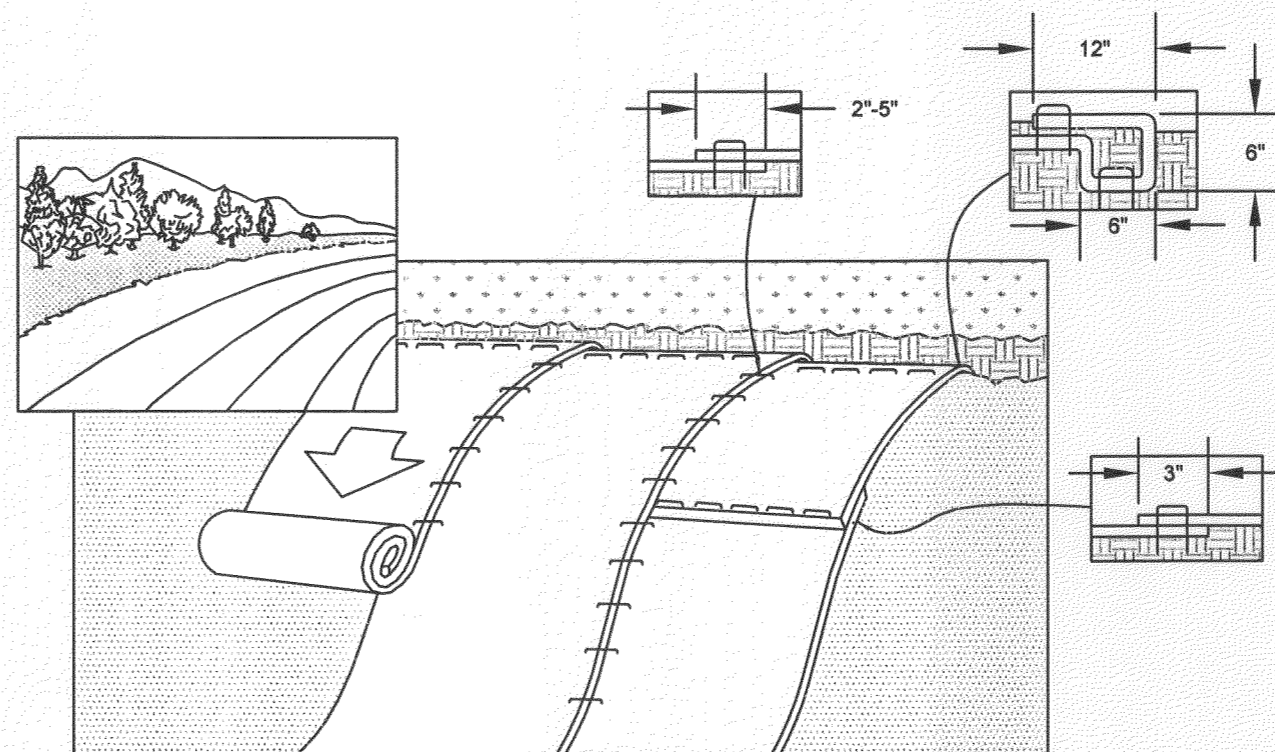


12 DOWN DRAIN CROSS SECTION
SCALE: 1" = 2'



DOWN DRAIN ID	CONDITION	TYPE OF PIPE	NOMINAL INSIDE PIPE DIAMETER (IN)
1	BY OTHERS	ADS N-12 CORRUGATED HDPE	30
2	EXISTING	SDR 32 1/2 SOLID WALL HDPE	42

19 D4 DOWN DRAIN SCHEDULE (BY OTHERS) SCALE: NTS



GENERAL NOTES:

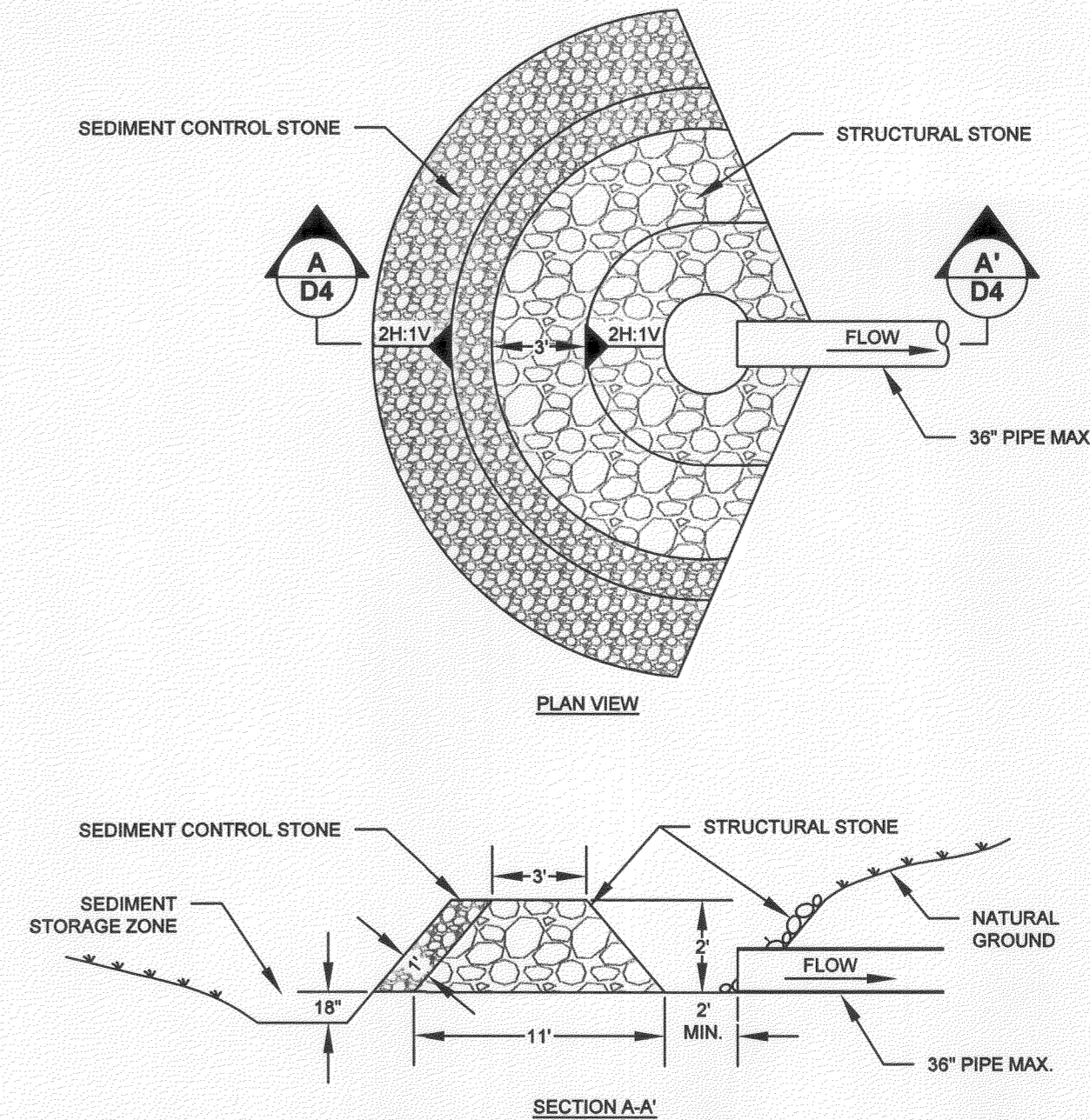
- TEMPORARY MATTING INSTALLED ON SLOPES SHALL BE NORTH AMERICAN GREEN TYPE SC-150 OR ENGINEER APPROVED EQUIVALENT.
- PREPARE SOIL BEFORE INSTALLING ROLLED EROSION CONTROL PRODUCTS (RECP'S), INCLUDING ANY NECESSARY APPLICATION OF LIME, FERTILIZER, AND SEED.
- BEGIN AT THE TOP OF THE SLOPE BY ANCHORING THE RECP'S IN A 6" DEEP X 6" WIDE TRENCH WITH APPROXIMATELY 12" OF RECP'S EXTENDED BEYOND THE UP-SLOPE PORTION OF THE TRENCH. ANCHOR THE RECP'S WITH A ROW OF STAPLES/STAKES APPROXIMATELY 12" APART IN THE BOTTOM OF THE TRENCH. BACKFILL AND COMPACT THE TRENCH AFTER STAPLING. APPLY SEED TO COMPACTED SOIL AND FOLD REMAINING 12" PORTION OF RECP'S BACK OVER SEED AND COMPACTED SOIL. SECURE RECP'S OVER COMPACTED SOIL WITH A ROW OF STAPLES/STAKES SPACED APPROXIMATELY 12" APART ACROSS THE WIDTH OF THE RECP'S.
- ROLL THE RECP'S DOWN OR HORIZONTALLY ACROSS THE SLOPE. RECP'S WILL UNROLL WITH APPROPRIATE SIDE AGAINST THE SOIL SURFACE. ALL RECP'S MUST BE SECURELY FASTENED TO SOIL SURFACE BY PLACING STAPLES/STAKES IN APPROPRIATE LOCATIONS AS SHOWN IN THE STAPLE PATTERN GUIDE. WHEN USING THE DOT SYSTEM, STAPLES/STAKES SHOULD BE PLACED THROUGH EACH OF THE COLORED DOTS CORRESPONDING TO THE APPROPRIATE STAPLE PATTERN.
- THE EDGES OF PARALLEL RECP'S MUST BE STAPLED WITH APPROXIMATELY 2" - 5" OVERLAP DEPENDING ON RECP'S TYPE.
- CONSECUTIVE RECP'S SPICED DOWN THE SLOPE MUST BE PLACED END OVER END (SHINGLE STYLE) WITH AN APPROXIMATE 3" OVERLAP. STAPLE THROUGH OVERLAPPED AREA, APPROXIMATE 12" APART ACROSS ENTIRE RECP'S WIDTH.

NOTE: IN LOOSE SOIL CONDITIONS, THE USE OF STAPLE OR STAKE LENGTHS GREATER THAN 6" MAY BE NECESSARY TO PROPERLY SECURE THE RECP'S.

MAINTENANCE NOTES:

- INSPECT RECP'S AT LEAST WEEKLY AND AFTER EACH RAINFALL EVENT THAT EXCEEDS 0.5 INCHES WITHIN A 24 HOUR PERIOD.
- GOOD CONTACT WITH THE GROUND MUST BE MAINTAINED, AND EROSION MUST NOT OCCUR BENEATH THE RECP'S.
- ANY AREAS OF THE RECP'S THAT ARE DAMAGED OR NOT IN CLOSE CONTACT WITH THE GROUND SHALL BE REPAIRED AND STAPLED.
- IF EROSION OCCURS DUE TO POORLY CONTROLLED DRAINAGE, THE PROBLEM SHALL BE FIXED AND THE ERODED AREA PROTECTED.
- MONITOR AND REPAIR THE RECP'S AS NECESSARY UNTIL GROUND COVER IS ESTABLISHED.

*REF: 6.17.12 NC EROSION AND SEDIMENT CONTROL PLANNING AND DESIGN MANUAL, 2006



GENERAL NOTES:

- INSTALL ROCK PIPE INLET PROTECTION AT CULVERTS RECEIVING FLOW ACROSS DISTURBED DITCHLINE AND IMPACTED DRIVEWAY CULVERTS.
- STRUCTURAL STONE SHALL BE CLASS B RIPRAP.
- SEDIMENT CONTROL STONE SHALL BE NO. 5 OR NO. 57 STONE.
- DIMENSIONS ARE MINIMUM ACCEPTABLE UNLESS OTHERWISE SPECIFIED BY THE ENGINEER.

MAINTENANCE NOTES:

- INSPECT ROCK PIPE INLET PROTECTION AT LEAST WEEKLY AND AFTER EACH RAINFALL EVENT THAT EXCEEDS 0.5 INCHES WITHIN A 24 HOUR PERIOD AND MAKE ANY NECESSARY REPAIRS IMMEDIATELY. REMOVE SEDIMENT AND RESTORE THE SEDIMENT STORAGE AREA TO ITS ORIGINAL DIMENSIONS WHEN THE SEDIMENT HAS ACCUMULATED TO ONE-HALF THE DESIGN DEPTH OF THE TRAP. PLACE THE SEDIMENT THAT IS REMOVED IN THE DESIGNED DISPOSAL AREA AND REPLACE THE CONTAMINATED PART OF THE GRAVEL FACING.
- CHECK THE STRUCTURE FOR DAMAGE. ANY RIPRAP DISPLACED FROM THE STONE HORSESHOE MUST BE REPLACED IMMEDIATELY.
- AFTER ALL THE SEDIMENT-PRODUCING AREAS HAVE BEEN PERMANENTLY STABILIZED, REMOVE THE STRUCTURE AND ALL THE UNSTABLE SEDIMENT. SMOOTH THE AREA TO BLEND WITH THE ADJOINING AREAS AND PROVIDE PERMANENT GROUND COVER (SURFACE STABILIZATION).

*REF: 6.55.3 NC Erosion and Sediment Control Planning and Design Manual, 2006

- ISSUED FOR CONSTRUCTION -

E&S DETAILS 2

CELLS 3 AND 4 STRUCTURAL FILL CLOSURE
MARSHALL STEAM STATION INDUSTRIAL LANDFILL NO. 1
TERRELL, NORTH CAROLINA

ENGINEERING LICENSE NO:
F-0176

DRAWN BY:
CLD

CHECKED BY:
IKB

DESIGNED BY:
IKB

APPROVED BY:
JJA/JSR

PROJECT NUMBER
1356-11-032

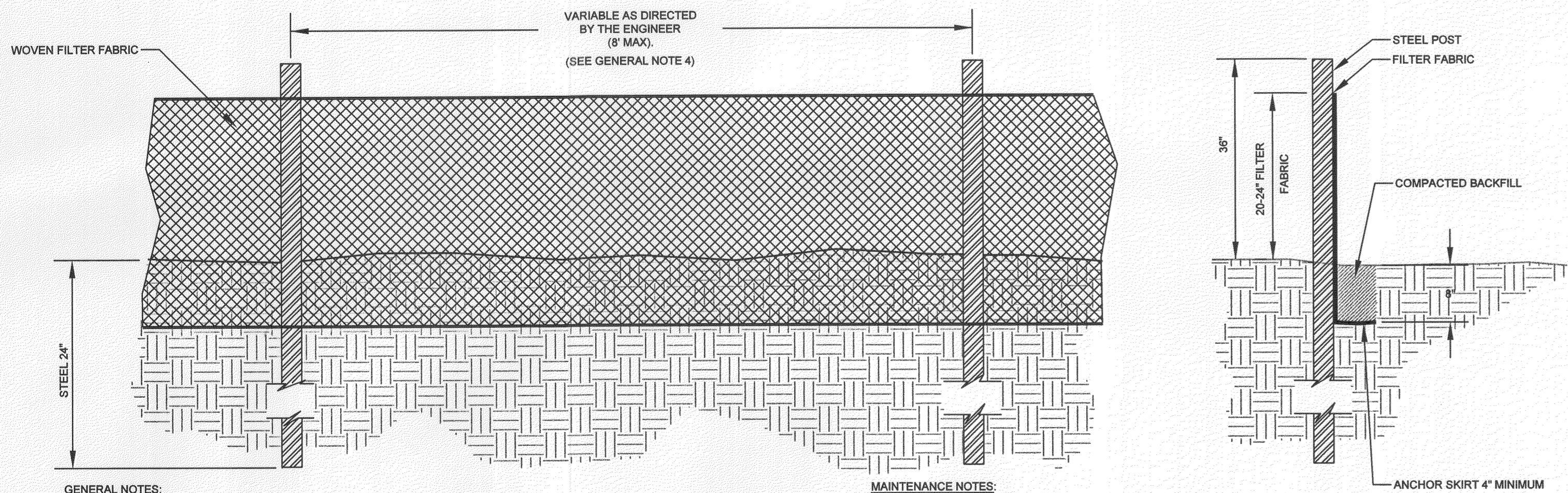
SCALE:
NTS

DATE:
06/12/13

DUKE ENERGY DRAWING NUMBER
D4 34 SF

DRAWING:
D4

OF:
10



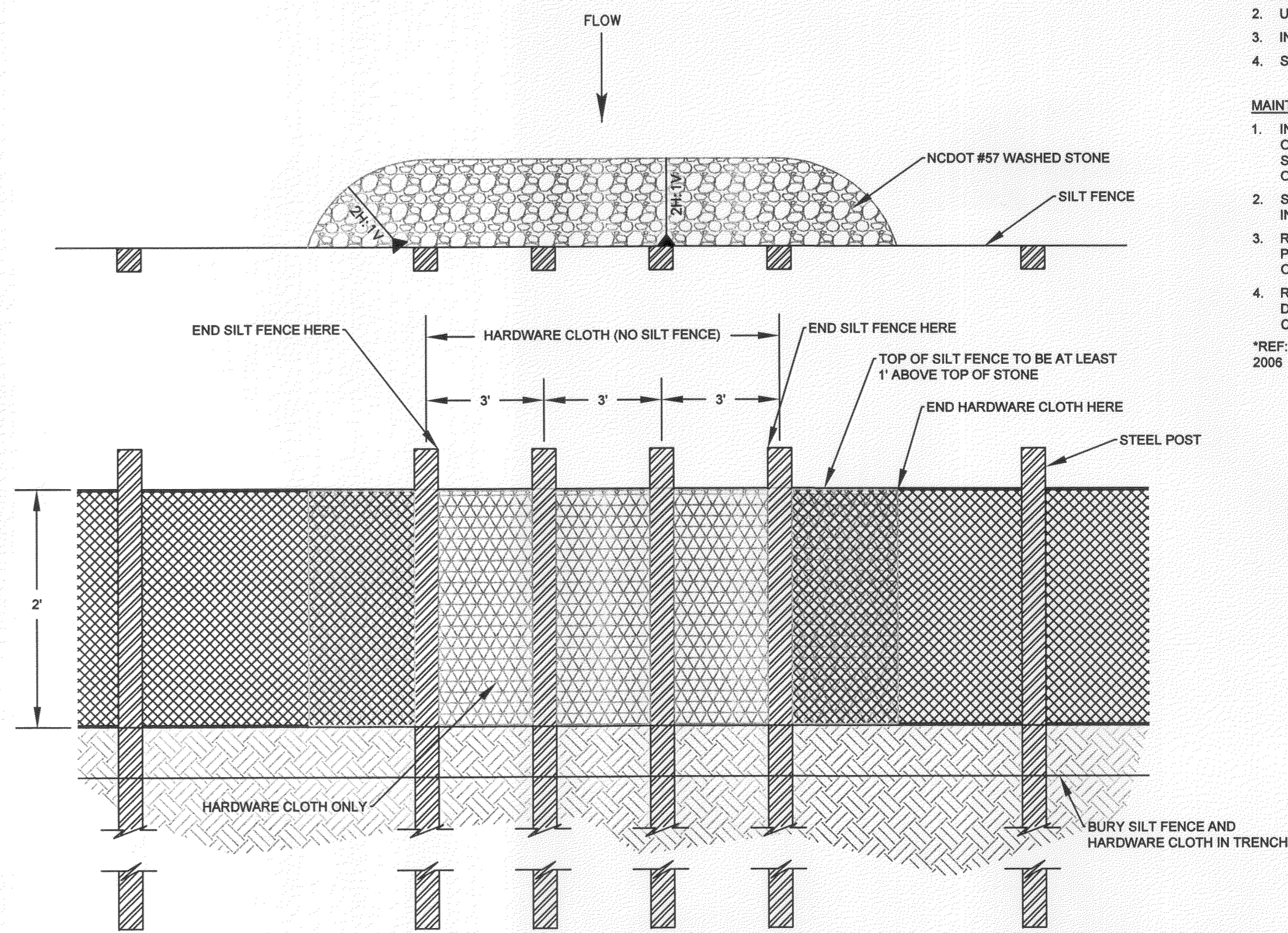
GENERAL NOTES:

1. PREFABRICATED SILT FENCE IS NOT ACCEPTABLE ON THIS PROJECT.
2. STEEL POSTS SHALL BE USED ON THIS PROJECT INSTEAD OF WOOD POSTS. STEEL POSTS SHALL BE 5'-0" IN HEIGHT AND BE OF THE SELF-FASTENER ANGLE STEEL TYPE.
3. WOVEN FILTER FABRIC SHALL BE USED WHERE SILT FENCE IS TO REMAIN FOR A PERIOD OF MORE THAN 30 DAYS. FILTER FABRIC FENCE SHALL BE A MINIMUM OF 32" IN WIDTH AND SHALL HAVE A MINIMUM OF 6 LINE WIRES WITH 12" STAY SPACING.
4. SILT FENCE SHALL BE STANDARD STRENGTH FILTER FABRIC WITH WIRE MESH REINFORCEMENT OR EXTRA STRENGTH FILTER FABRIC. WHEN FABRIC IS USED WITH WIRE MESH, 8" CENTERED POSTS MAY BE USED. OMISSION OF THE REINFORCING WIRE IS A CONSTRUCTION CHANGE THAT NECESSITATES MORE POSTS FOR SUPPORT (IE. THE SPACING DISTANCE NEEDS TO BE REDUCED TO NO GREATER THAN SIX (6) FEET APART).
5. TURN SILT FENCE UP SLOPE AT ENDS.
6. THE USE OF SILT FENCE IN AREAS OF CONCENTRATED FLOW IS INAPPROPRIATE

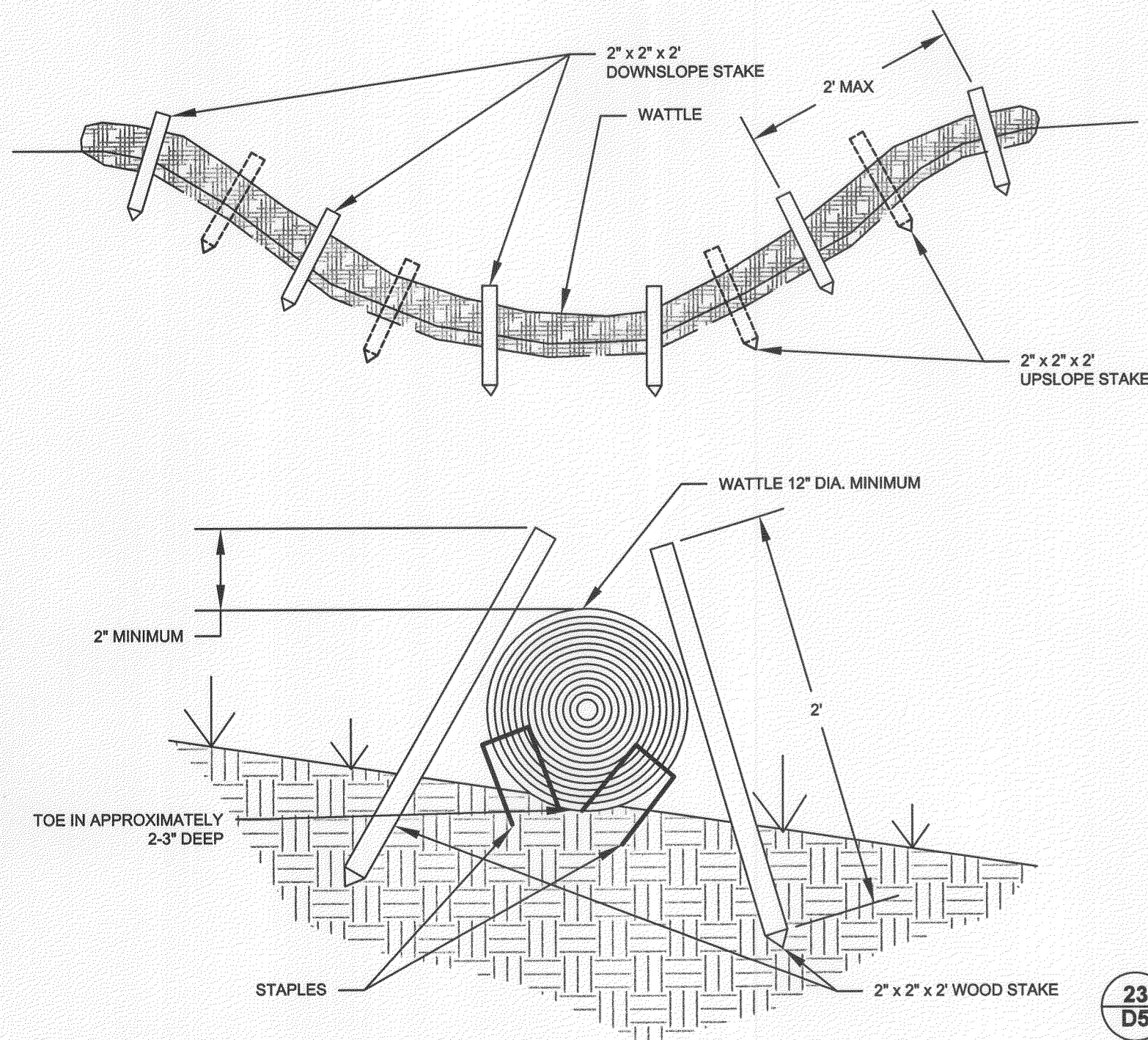
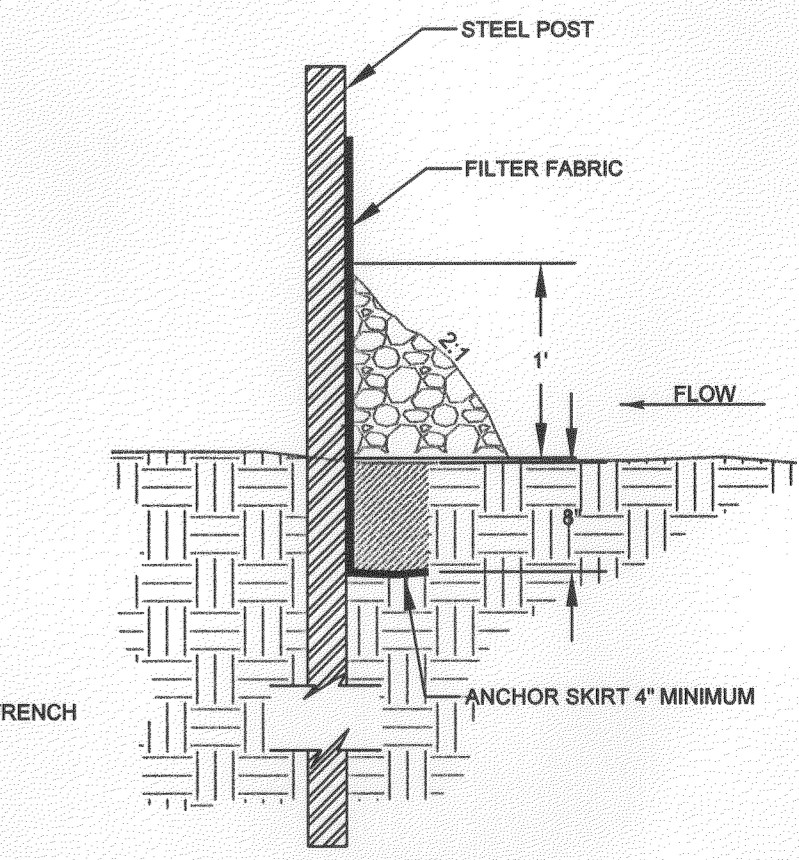
MAINTENANCE NOTES:

1. INSPECT SILT FENCE AT LEAST ONCE A WEEK AND AFTER EACH SIGNIFICANT (0.5" OR GREATER) RAINFALL IN A 24 HOUR PERIOD AND MAKE ANY REQUIRED REPAIRS IMMEDIATELY.
2. SHOULD THE FABRIC OF A SILT FENCE COLLAPSE, TEAR, DECOMPOSE OR BECOME INEFFECTIVE, REPLACE IT PROMPTLY.
3. REMOVE SEDIMENT DEPOSITS AS NECESSARY TO PROVIDE ADEQUATE STORAGE VOLUME FOR THE NEXT RAIN AND TO REDUCE PRESSURE ON THE FENCE. TAKE CARE TO AVOID UNDERMINING THE FENCE DURING CLEANOUT.
4. REMOVE ALL FENCING MATERIALS AND UNSTABLE SEDIMENT DEPOSITS AND BRING THE AREA TO GRADE AND STABILIZE IT AFTER THE CONTRIBUTING DRAINAGE AREA HAS BEEN PROPERLY STABILIZED.

*REF: 6.62.7 NC Erosion and Sediment Control Planning and Design Manual, 2006



22
D5 SILT FENCE OUTLET
SCALE: NTS



23
D5 WATTLE
SCALE: NTS

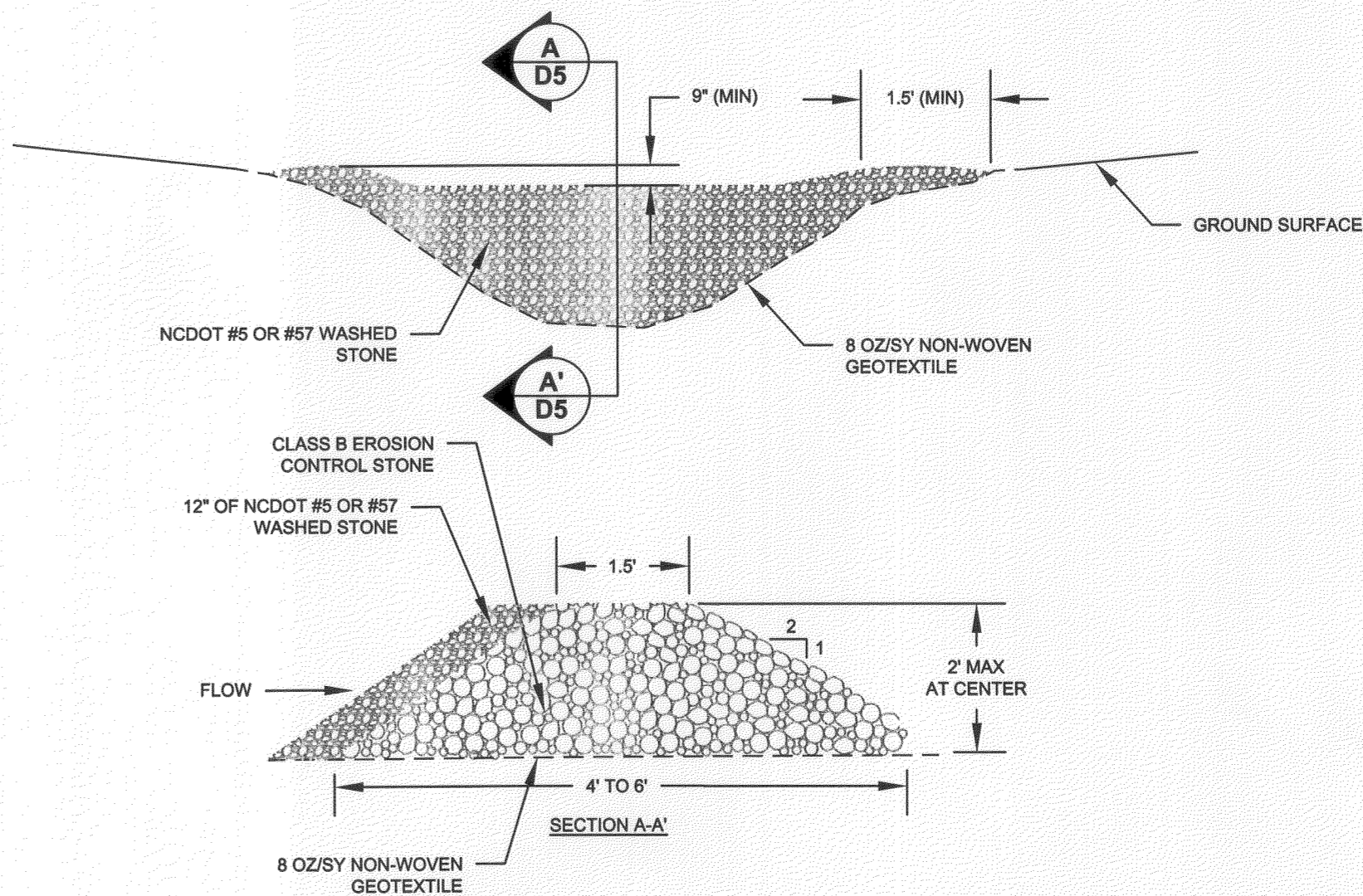
GENERAL NOTES:

1. ONLY INSTALL WATTLE(S) TO A HEIGHT IN DITCH SO FLOW WILL NOT WASH AROUND WATTLE AND SCOUR DITCH SLOPES AND AS DIRECTED.
2. SPACE WOODEN STAKES 2 FEET O.C. ALONG DITCH SLOPE.
3. INSTALL A MINIMUM OF 2 UPSLOPE STAKES AND 4 DOWNSLOPE STAKES AT AN ANGLE TO WEDGE WATTLE TO BOTTOM OF DITCH.
4. PROVIDE STAPLES MADE 0.125 IN. DIAMETER STEEL WIRE FORMED INTO A U-SHAPE NOT LESS THAN 12" IN LENGTH.
5. INSTALL STAPLES APPROXIMATELY EVERY 1 LINEAR FOOT ON BOTH SIDES OF WATTLE AND EACH END TO SECURE IT TO SOIL.

MAINTENANCE NOTES:

1. INSPECT WATTLES AT LEAST WEEKLY AND AFTER EACH SIGNIFICANT (0.5" OR GREATER) RAINFALL EVENT AND MAKE ANY REQUIRED REPAIRS IMMEDIATELY.
2. THERE ARE TO BE NO GAPS BETWEEN ADJACENT WATTLES OR BETWEEN SOIL SURFACE AND WATTLE BOTTOM.
3. REPAIR ANY UPSLOPE OR UNDERCUTTING DEFICIENCIES FOR PROPER PERFORMANCE.
4. REMOVE ALL FILTRATION IMPEDIMENTS INCLUDING SEDIMENT DEPOSITS AND LOOSE DEBRIS WHEN SUCH CONDITIONS IMPACT WATTLE FUNCTIONALITY.
5. SEDIMENT BUILD UP SHOULD NOT BE ALLOWED TO EXCEED ONE THIRD OF WATTLE HEIGHT.
6. MONITOR CHANGING CONDITIONS TO ANTICIPATE WATTLE REMOVAL OR REPLACEMENT.

*REF: NCDOT ROADSIDE ENVIRONMENTAL UNIT: SOIL AND WATER SECTION



GENERAL NOTES:

1. STONE SHOULD BE PLACED OVER THE CHANNEL BANKS TO KEEP WATER FROM CUTTING AROUND THE DAM.

MAINTENANCE NOTES:

1. INSPECT CHECK DAMS AND CHANNELS AT LEAST WEEKLY AND AFTER EACH SIGNIFICANT (0.5" OR GREATER) RAINFALL IN A 24 HOUR PERIOD AND MAKE ANY NECESSARY REPAIRS IMMEDIATELY. CLEAN OUT SEDIMENT, STRAW, LIMBS, OR OTHER DEBRIS THAT COULD CLOG THE CHANNEL WHEN NEEDED.
2. ANTICIPATE SUBMERGENCE AND DEPOSITION ABOVE THE CHECK DAM AND EROSION FROM HIGH FLOWS AROUND THE EDGES OF THE DAM. CORRECT ALL DAMAGE IMMEDIATELY. IF SIGNIFICANT EROSION OCCURS BETWEEN DAMS, ADDITIONAL MEASURES CAN BE TAKEN SUCH AS, INSTALLING A PROTECTIVE RIPRAP LINER IN THAT PORTION OF THE CHANNEL (PRACTICE 6.31, RIPRAP-LINE AND PAVED CHANNELS).
3. REMOVE SEDIMENT ACCUMULATED BEHIND THE DAMS AS NEEDED TO PREVENT DAMAGE TO CHANNEL VEGETATION. ALLOW THE CHANNEL TO DRAIN THROUGH THE STONE CHECK DAM, AND PREVENT LARGE FLOWS FROM CARRYING SEDIMENT OVER THE DAM. ADD STONES TO DAMS AS NEEDED TO MAINTAIN DESIGN HEIGHT AND CROSS SECTION.

*REF: 6.63.3 NC Erosion and Sediment Control Planning and Design Manual, 2006

24
D5 CHECK DAM
SCALE: NTS

GENERAL NOTES:

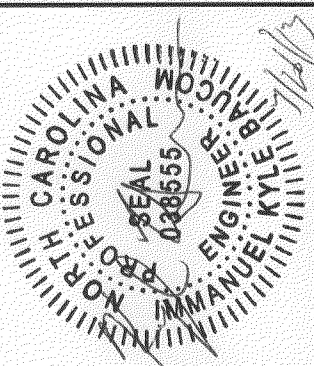
1. USE NO. 5 OR NO. 57 STONE FOR SEDIMENT CONTROL.
2. USE HARDWARE CLOTH 24 GAUGE WIRE MESH WITH 1/2" MESH OPENINGS.
3. INSTALL 6" SELF FASTENER ANGLE STEEL POST 2' DEEP MINIMUM
4. SPACE POST A MAXIMUM OF 3'.

MAINTENANCE NOTES:

1. INSPECT OUTLETS AT LEAST WEEKLY AND AFTER EACH SIGNIFICANT (0.5" OR GREATER) RAINFALL EVENT AND REPAIR IMMEDIATELY. CLEAN OUT SEDIMENT, STRAW, LIMBS, OR OTHER DEBRIS THAT COULD CLOG THE OUTLET WHEN NEEDED.
2. SHOULD THE FABRICS OF THE OUTLET COLLAPSE, TEAR, OR BECOME INEFFECTIVE REPLACE THEM PROMPTLY.
3. REMOVE SEDIMENT ACCUMULATED BEHIND THE OUTLET AS NEEDED TO PREVENT DAMAGE SILT FENCE AND OUTLET MEASURES. ADD STONE TO OUTLET AS NEEDED TO MAINTAIN DESIGN HEIGHT AND CROSS SECTION.
4. REMOVE ALL FENCING AND OUTLET MATERIALS AND UNSTABLE SEDIMENT DEPOSITS AND BRING THE AREA TO GRADE AND STABILIZE IT AFTER THE CONTRIBUTING DRAINAGE AREA HAS BEEN PROPERLY STABILIZED.

*REF: NC DOT Roadway Standard Detail 1606.01 - Special Sediment Control Fence, 2006

- ISSUED FOR CONSTRUCTION -



NO.	DATE	DESCRIPTION	BY
1	07/26/13	ISSUED FOR CONSTRUCTION	IKB
0	06/25/13	BID ISSUE: ADDED OPTIONAL EASC MEASURES FOR BID PURPOSES	IKB

E&SC DETAILS 3	CELLS 3 AND 4 STRUCTURAL FILL CLOSURE
	MARSHALL STEAM STATION INDUSTRIAL LANDFILL NO. 1
	TERRELL, NORTH CAROLINA

ENGINEERING LICENSE NO: F-0176	DRAWN BY: CLD	CHECKED BY: IKB
DESIGNED BY: IKB	APPROVED BY: JJA/JSR	PROJECT NUMBER: 1356-11-032
SCALE: NTS	DATE: 06/25/13	DUKE ENERGY DRAWING NUMBER: D5 34 SF
DRAWING: D5	OF: 10	

**APPENDIX II – PROJECT
DOCUMENTATION
Section 4 – Issued for Construction
Specifications**



**TECHNICAL SPECIFICATIONS
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01000	General Requirements
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DIVISION 2 - SITE CONSTRUCTION

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02374	Erosion Control Devices
02610	Pipe Culverts
02674	Nonwoven Geotextiles
02924	Seeding and Soil Supplements

SECTION 01000
GENERAL REQUIREMENTS

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Summary Work
 - a. Project Summary
 - b. Engineer Responsibilities
 - c. Contractor and Subcontractor Qualifications
 - d. Work Sequence
 - 2. Schedule
 - a. General Requirements
 - b. Schedule
 - c. Meetings
 - 3. Price Payment
 - a. Change Procedures.
 - b. Defect Assessment
 - c. Unit Prices
 - 4. Administrative Requirements
 - a. Submittal Procedures
 - 5. Quality Requirements
 - a. Quality Control and Control of Installation
 - b. Tolerances
 - c. Testing and Observation Requirements
 - 6. Temporary Facility Controls
 - a. Temporary Controls
 - b. Temporary Facilities
 - c. Site Security
 - 7. Product Requirements
 - a. Product Substitution Procedures
 - 8. Execution Requirements
 - a. Closeout Procedures
 - b. Project Record Documents

PART 2 SUMMARY WORK

2.1 PROJECT SUMMARY

- A. The scope of work is defined in Exhibit B, Section 01010.
- B. Optional work items for construction are identified on the Bid Worksheet

- C. Perform Work of Contract under stipulated sum with Owner in accordance with Conditions of Contract.
- D. Work of Contract shall be constructed to the lines and elevations as shown on the Drawings and as identified in these Technical Specifications. Any deviations from the Drawings or Technical Specifications require the prior written approval of the ENGINEER and must be documented by "record" revisions to the Drawings and/or Technical Specifications.
- E. During phases of construction, construction will be tested, monitored, and evaluated prior to approval.

2.2 ENGINEER RESPONSIBILITIES

- A. Engineer will be Owner's representative during the construction period. The duties and responsibilities and the limitations of authority of Engineer as Owner's representative during construction are set forth as follows and will not be changed without written consent of Owner and Engineer.
 - 1. Neither Engineer's authority or responsibility under this Section or under any other provision of the Contract Documents nor any decision made by Engineer in good faith either to exercise or not exercise such authority or responsibility or the undertaking, exercise, or performance of any authority or responsibility by Engineer shall create, impose, or give rise to any duty in contract, tort, or otherwise owed by Engineer to Contractor, any Subcontractor, any Supplier, any other individual or entity, or to any surety for or employee or agent of any of them.
 - 2. Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Engineer will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.
 - 3. Engineer will not be responsible for the acts or omissions of Contractor or of any Subcontractor, any Supplier, or of any other individual or entity performing any of the Work.
 - 4. Engineer's review of the final Application for Payment and accompanying documentation and all maintenance and operating instructions, schedules, guarantees, bonds, certificates of inspection, tests and approvals, and other documentation required to be delivered by the Contract Documents will only be to determine generally that their content complies with the requirements of, and in the case of certificates of inspections, tests, and approvals that the results certified indicate compliance with the Contract Documents.
 - 5. The limitations upon authority and responsibility set forth in this Section shall also apply to the Resident Project Representative, if any, and assistants, if any.

2.3 CONTRACTOR AND SUBCONTRACTOR QUALIFICATIONS

- A. General Contractor (Contractor AND Subcontractor):
 - 1. The Contractor AND Subcontractor must be qualified and experienced in construction work and must complete and must submit qualifications as required by the Bid Instructions.
- B. Surveyor:
 - 1. All field layouts shall be performed by or under the supervision of a licensed Professional Land Surveyor registered in the state where the Work is to be conducted. The Contractor shall establish and maintain a minimum of two permanent benchmarks. Horizontal and vertical locations of the benchmarks shall be recorded on the Record Drawings.

2.4 WORK SEQUENCE

- A. General Order of Construction. During and prior to construction period, coordinate construction schedule and operations with Owner, Engineer, and any other applicable parties.
- B. The work sequence shall generally follow the work description summarized in Exhibit B, Section 01010, and shall be consistent with the work sequences identified in the Erosion and Sediment Control Plan and permit.

PART 3 SCHEDULE

3.1 GENERAL REQUIREMENTS

- A. The platform for this schedule shall be in an electronic format agreeable to the Owner.
- B. Specific schedule format shall include activities, start date, finish date, duration, activity logic (predecessor and successor activities), percent progress, and milestones.
- C. The Contractor shall only be permitted to work during daylight hours, but not more than 10 hours per day. The Contractor shall not be permitted to work more than 6 work days in a calendar week. The Contractor may seek exceptions to these work hours with Duke Energy authorization.
- D. The schedule calendar shall be depicted with defined work hours i.e. 4 – 10's, 5 – 10's, etc.
- E. Bidders shall submit a proposed project schedule with their bids and the successful Bidder shall submit a final project schedule within 15 days of award.

3.2 SCHEDULE

- A. It is suggested that the schedule include at a minimum those items described in the scope of work in Exhibit B, Section 01010.
- B. The schedule shall include but not be limited to the following milestones:
 - 1. Mobilization and Personnel Training
 - 2. Finished Soil Cover
 - 3. Finished Topsoil Cover
 - 4. Project Substantial Completion
 - 5. Demobilization
 - 6. Completion Acceptance
- C. During construction, the schedule shall be updated on a bi-weekly basis and as otherwise requested by the Owner.

3.3 MEETINGS

- A. The successful bidder shall allow and plan for the following meetings in the project schedule:
 - 1. Regular weekly construction progress meetings with the Owner.

PART 4 PRICE PAYMENT

4.1 CHANGE PROCEDURES

- A. Submittals: Submit name of individual authorized to receive change documents, and be responsible for informing others in Contractor's employ or Subcontractors of changes to the Work.
- B. The Engineer will advise of minor changes in the Work not involving adjustment to Contract Sum/Price or Contract Time.
- C. The Engineer may issue a Notice of Change including a detailed description of proposed change with supplementary or revised Drawings and specifications, a change in Contract Time for executing the change, and the period of time during which the requested price will be considered valid. Contractor will prepare and submit estimate within three days.
- D. Contractor may propose changes by submitting a request for change to Engineer, describing proposed change and its full effect on the Work. Include a statement describing reason for the change, and effect on Contract Sum/Price and Contract Time with full documentation and a statement describing effect on Work by separate or other Contractors. Document requested substitutions in accordance with Part 7 of this Specification.
- E. Work Directive Change: Engineer may issue directive instructing Contractor to proceed with change in the Work, for subsequent inclusion in a Change Order. Document will describe changes in the Work, and designate method of determining any change in Contract Sum/Price or Contract Time. Promptly execute change.

4.2 DEFECT ASSESSMENT

- A. Replace the Work, or portions of the Work, not conforming to specified requirements.
- B. If, in the opinion of the Engineer and/or Owner, it is not practical to remove and replace the Work, the Engineer will direct appropriate remedy or adjust payment.
- C. Individual specification sections may modify these options or may identify specific formula or percentage sum/price reduction.
- D. Authority of Engineer and/or Owner to assess defects and identify payment adjustments is final.
- E. Non-Payment For Rejected Products: Payment will not be made for rejected products for any of the following:
 - 1. Products wasted or disposed of in a manner that is not acceptable.
 - 2. Products determined as unacceptable before or after placement.
 - 3. Products not completely unloaded from transporting vehicle.
 - 4. Products placed beyond lines and levels of required Work.
 - 5. Products remaining on hand after completion of the Work.
 - 6. Loading, hauling, and disposing of rejected products.

4.3 UNIT PRICES

- A. Unit Quantities
 - 1. Measurement methods delineated in individual specification sections complement criteria of this section. In event of conflict, requirements of individual specification section govern.
 - 2. Take measurements and compute quantities. Engineer will verify measurements and quantities.

3. Quantities and measurements indicated in Bid Form and/or Contract Documents are for contract purposes only. Quantities and measurements supplied or placed in the Work shall determine payment. Final payment for Work governed by unit prices will be made on basis of actual measurements and quantities accepted by Engineer multiplied by unit sum/price for Work incorporated in or made necessary by the Work.
 - a. When actual Work requires more or fewer quantities than those quantities indicated, provide required quantities at unit prices contracted.
 - b. When actual Work requires 30 percent or greater change in quantity than those quantities indicated, Owner or Contractor may claim for Contract Price adjustment.
- B. Unit Prices
 1. Payment Includes: Full compensation for required labor, products, tools, equipment, plant and facilities, transportation, services and incidentals; erection, application or installation of item of the Work; overhead and profit.
 2. Specific Item Unit Pricing is delineated in the individual specification sections.
 3. Mobilization
 - a. Basis of Measurement: By lump sum.
 - b. Basis of Payment: Includes mobilization for the project.

PART 5 ADMINISTRATIVE REQUIREMENTS

5.1 SUBMITTAL PROCEDURES

- A. Transmit each submittal with Engineer accepted form.
- B. Sequentially number transmittal forms. Mark revised submittals with original number and sequential alphabetic suffix.
- C. Identify Project, Contractor, Subcontractor and Supplier; pertinent drawing and detail number, and specification section number, appropriate to submittal.
- D. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of products required, field dimensions, adjacent construction Work, and coordination of information is in accordance with requirements of the Work and Contract Documents.
- E. Identify variations from Contract Documents and product or system limitations, which may be detrimental to successful performance of completed Work.
- F. When revised for resubmission, identify changes made since previous submission.
- G. Submittals not requested will not be recognized or processed.

PART 6 QUALITY REQUIREMENTS

6.1 QUALITY CONTROL AND CONTROL OF INSTALLATION

- A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.
- B. Comply with manufacturers' and/or supplier's instructions, including each step in sequence.

- C. When manufacturers' and/or supplier's instructions conflict with Contract Documents, request clarification from Engineer before proceeding.
- D. Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- E. Perform Work by persons qualified to produce specified quality.
- F. Verify field measurements are as indicated on Construction Drawings or as instructed by manufacturer.
- G. Materials stored off the site shall be stored in accordance with Manufacturer recommendations and stored in a bonded warehouse and shall be clearly marked as being for this project.

6.2 TOLERANCES

- A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.
- B. Comply with manufacturers' tolerances. When manufacturers' tolerances conflict with Contract Documents, request clarification from Engineer before proceeding.
- C. Adjust products to appropriate dimensions; position before securing products in place.

6.3 TESTING AND OBSERVATION REQUIREMENTS

- A. Testing and observation services for the purpose of conducting tests shall be performed by the Engineer as required by the technical specifications. All costs of testing shall be paid by the Owner. The entity providing the testing and observation services shall be referred to as the construction quality assurance (CQA) agent herein.
- B. Testing, observations and source quality control may occur on or off project site. Perform off-site testing as required by Engineer or Owner.
- C. Cooperate with CQA agent; furnish samples of materials, equipment, tools, storage, safe access, and assistance by incidental labor as requested.
 - 1. The Contractor shall give ample advance notice to the CQA agent and Engineer prior to expected time for operations requiring testing services and/or before covering up items that require inspection.
 - 2. Make arrangements with CQA agent and pay for additional samples and tests required for Contractor's use.
- D. Testing and employment of testing agency or laboratory shall not relieve Contractor of obligation to perform Work in accordance with requirements of Contract Documents.
- E. Re-testing or observation required because of non-conformance to specified requirements shall be performed by same CQA agent on instructions by Engineer. Payment for re-testing will be charged to Contractor by deducting testing charges from Contract Sum/Price.
- F. CQA Agent Responsibilities:
 - 1. Provide qualified personnel at site. Cooperate with Engineer and Contractor in performance of services.
 - 2. Perform specified sampling and testing of products in accordance with specified standards.

3. Ascertain compliance of materials with requirements of Contract Documents.
4. Promptly notify Engineer and Contractor of observed irregularities or non-conformance of Work or products.
5. Perform additional tests required by Engineer.
6. Attend preconstruction meetings and progress meetings.

PART 7 TEMPORARY FACILITY CONTROLS

7.1 TEMPORARY CONTROLS

- A. Barriers
 1. Provide barriers to prevent unauthorized entry to construction areas and to protect existing facilities and adjacent properties from damage from construction operations and demolition.
- B. Water Control
 1. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.
 2. Provide water barriers as required to protect site from soil erosion according to project's Erosion and Sedimentation Control Plan.
- C. Dust Control
 1. Execute Work by methods to minimize raising dust from construction operations.
 2. Provide positive means to prevent air-borne dust from dispersing into atmosphere.
 3. The Contractor shall follow the approved Dust Control Plan for the existing Cells 1 and 2 as directed by Duke Energy.
- D. Erosion and Sediment Control
 1. Follow project's Erosion and Sedimentation Control Plan.
 2. Perform an inspection 10 months after Substantial Completion (or when ground stabilization is sufficient) with the Owner and NCDENR Land Quality Section to close the Erosion and Sedimentation Control Plan. The Contractor shall remove temporary E&SC measures and/or make any necessary repairs resulting from the E&SC inspection.
 3. Plan and execute construction by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.
 4. Minimize surface area of bare soil exposed at one time.
 5. Provide temporary measures including berms, dikes, and drains, and other devices to prevent water flow across disturbed areas.
 6. Construct fill and waste areas by selective placement to avoid erosive surface.
 7. Periodically inspect earthwork to detect evidence of erosion and sedimentation; promptly apply corrective measures.
 8. Optional item: Performing post- construction inspections at least weekly and after each 0.5-inch or greater rainfall event, as well as making any necessary repairs resulting from the inspections.

7.2 TEMPORARY FACILITIES

- A. Contractor shall provide portable toilet and hand-wash facilities for their employees and subcontractors in accordance with OSHA's per-person ratio, at no additional expense to the owner (price to be included in the base bid). Toilets will be serviced and maintained such that no sustained nuisance odors come from them.

7.3 SITE SECURITY

- A. The Contractor is responsible for securing the work area, equipment, and materials. Owner will not be responsible for vandalism, damage, or theft of equipment and materials on the job site.

PART 8 PRODUCT REQUIREMENTS

8.1 PRODUCT SUBSTITUTION PROCEDURES

- A. Substitutions may be considered when a product becomes unavailable through no fault of Contractor.
- B. Document each request with complete data substantiating compliance of proposed Substitution with Contract Documents.
- C. Substitutions will not be considered when they are indicated or implied on Shop Drawing or Product Data submittals, without separate written request, or when acceptance will require revision to Contract Documents.
- D. Document each request with complete data substantiating compliance of proposed Substitution with Contract Documents.
- E. A request constitutes a representation that Contractor:
 - 1. Has investigated proposed product and determined that it meets or exceeds quality level of specified product.
 - 2. Will provide same warranty for Substitution as for specified product.
 - 3. Will coordinate installation and make changes to other Work which may be required for the Work to be complete with no additional cost to Owner.
 - 4. Waives claims for additional costs or time extension which may subsequently become apparent.
 - 5. Will reimburse Owner and/or Engineer for review or redesign services associated with re-approval by authorities having jurisdiction.
- F. Substitutions will not be considered when they are indicated or implied on Shop Drawing or Product Data submittals, without separate written request, or when acceptance will require revision to Contract Documents.
- G. Substitution Submittal Procedure:
 - 1. Submit three copies of request for Substitution for consideration. Limit each request to one proposed Substitution.
 - 2. Submit Shop Drawings, Product Data, and certified test results attesting to proposed product equivalence. Burden of proof is on proposer.
 - 3. Engineer will notify Contractor in writing of decision to accept or reject request.

PART 9 EXECUTION REQUIREMENTS

9.1 CLOSEOUT PROCEDURES

- A. Final Application for Payment shall be accompanied by the following documents:
 - 1. Guarantees of all materials and workmanship.
 - 2. Contractor's Affidavit, Release and Waiver of Claims.
 - 3. Consent of Surety (if applicable).

4. Final State/County Sales/Use Tax Statement (if applicable).
5. Complete list of all Subcontractors and areas of work performed.
6. Proof of Compliance with Building Standards.
7. MWBE Documentation of Final Contract Payments (if applicable).
8. Warranties as described in Exhibit I.

9.2 PROJECT RECORD DOCUMENTS

- A. Maintain on site one set of the following record documents; record actual revisions to the Work:
 1. Drawings.
 2. Specifications.
 3. Approved Erosion and Sediment Control Plan.
 4. Addenda.
 5. Change Orders and other modifications to the Contract.
 6. Reviewed Shop Drawings, Product Data, and Samples.
 7. Manufacturer's instruction for assembly, installation, and adjusting.
- B. Ensure entries are complete and accurate, enabling future reference by Owner.
- C. Store record documents separate from documents used for construction.
- D. Record information concurrent with construction progress, not less than weekly. For each item, include percentage of work complete versus percentage of work invoiced.
- E. Specifications: Legibly mark and record at each product section description of actual products installed, including the following:
 1. Manufacturer's name and product model and number.
 2. Product substitutions or alternates utilized.
 3. Changes made by Addenda and modifications.
- F. Record Drawings: Certified by a Professional Land Surveyor licensed in the state of North Carolina. Legibly mark each item to record actual construction including:
 1. Measured depths of foundations in relation to finish floor datum.
 2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
 3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
 4. Field changes of dimension and detail.
 5. Details not on original Contract drawings.
- G. Submit documents to Engineer.

END OF SECTION

SECTION 02060
AGGREGATE

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Aggregate Type A1 – No. 57 stone for drainage aggregate and erosion and sediment control structures.
 - 2. Aggregate Type A2 – Class B riprap for erosion and sediment control structures.
- B. Related Sections:
 - 1. Section 02374 – Erosion Control Devices

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

- A. Coarse and Fine Aggregate:
 - 1. Basis of Measurement: Included with Section 02374.
 - 2. Basis of Payment: Included with Section 02374.

1.3 REFERENCES

- A. American Association of State Highway and Transportation Officials:
 - 1. AASHTO T11 – Standard Method of Test for Materials Finer than 75 μm (No. 200) Sieve in Mineral Aggregates by Washing.
 - 2. AASHTO T27 – Standard Method of Test for Sieve Analysis of Fine and Coarse Aggregates.
 - 3. AASHTO T180 – Standard Method of Test for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop (as modified by NCDOT).
- B. ASTM International:
 - 1. ASTM C33 – Standard Specification for Construction Aggregates
 - 2. ASTM C136 – Standard Test Method for Sieve Analysis of Fine and Coarse Aggregate.
 - 3. ASTM D421 – Standard Practice for Dry Preparation of Soil Samples for Particle-Size Analysis and Determination of Soil Constants.
 - 4. ASTM D422 – Standard Test Method for Particle Size Analysis of Soils.
 - 5. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12 400 ft-lbf/ft³ (600 kN-m/m³)).
 - 6. ASTM D1556 – Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.
 - 7. ASTM D1557 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 10 lb Rammer and 18 inch Drop.
 - 8. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
 - 9. ASTM D2922 - Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
 - 10. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).
 - 11. ASTM D4253 – Standard Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table.
 - 12. ASTM D4254 – Standard Test Method for Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density.

- C. North Carolina Department of Transportation (NCDOT) Standard specifications for Roads and Structures.

1.4 SUBMITTALS

- A. Materials Source: Submit name of imported materials suppliers and description of material.
- B. Manufacturer's/Supplier's Certificate: Certify materials meet or exceed specified requirements.
- C. Requested payment quantities will be submitted by the Contractor with final approval by the Engineer.

1.5 QUALITY ASSURANCE

- A. Furnish each aggregate material type from single source throughout the Work.
- B. Perform Work in accordance with North Carolina Department of Transportation Standard Specifications for Roads and Structures or as otherwise specified.

PART 2 PRODUCTS

2.1. FINE AND COARSE AGGREGATE MATERIALS

- A. Coarse Aggregate Type A1 – Drainage Aggregate: Subangular, subrounded, rounded, or well rounded particle shaped conforming to No. 57 Stone NCDOT Standards. Coarse Aggregate Type A1 shall be used in the pipe inlet protection as shown on the Drawings.
- B. Coarse Aggregate Type A2: Conforming to Class B Riprap NCDOT standards. Coarse aggregate Type A2 shall be used for drainage feature outlet protection, and pipe inlet protection as shown on the Drawings.

2.2 SOURCE QUALITY CONTROL

- A. Aggregate Material - Testing and Analysis: Perform in accordance with ASTM C33, ASTM C136, ASTM D421, ASTM D422, ASTM D4253, ASTM D4254, AASHTO T11, and/or AASHTO T27.
- B. When tests indicate materials do not meet specified requirements, change material or material source and retest.
- C. Furnish materials of each type from same source throughout the Work.

PART 3 EXECUTION

3.1. STOCKPILING

- A. Stockpile materials on site at locations agreed upon by Engineer and Owner.
- B. Stockpile in sufficient quantities to meet Project schedule and requirements.
- C. Separate differing materials with dividers or stockpile apart to prevent mixing.
- D. Direct surface water away from stockpile site so as to prevent erosion or deterioration of materials.

3.2. STOCKPILE CLEANUP

- A. Remove stockpile, leave area in clean and neat condition. Grade site surface to prevent free standing surface water and restore to original site conditions.

3.3. EXAMINATION

- A. Verify substrate has been inspected, gradients and elevations are correct, and is dry.

3.4. PREPARATION

- A. Correct irregularities in substrate gradient and elevation by scarifying, reshaping, and re-compacting.
- B. Do not place fill on soft, muddy, or frozen surfaces.

3.5. AGGREGATE PLACEMENT

- A. Spread aggregate over prepared substrate to a total compacted thickness as specified on Drawings.
- B. Place aggregate in a maximum layer and compact to specified density.
- C. Level and contour surfaces to elevations and gradients indicated.
- D. Add water to assist compaction. If excess water is apparent, remove aggregate and aerate to reduce moisture content.
- E. Use mechanical tamping equipment in areas inaccessible to compaction equipment.

3.6. TOLERANCES

- A. Scheduled Compacted Thickness: Within ¼ inch.
- B. Variation From Design Elevation: Within ½ inch.

3.7. FIELD QUALITY CONTROL

- A. Compaction testing will be performed in accordance with ASTM D1556, ASTM D1557, ASTM D698, AASHTO T180 (as modified by NCDOT), ASTM D2167, ASTM D2922, and/or ASTM D3017.
- B. If tests indicate Work does not meet specified requirements, remove Work, replace and retest.

END OF SECTION

SECTION 02230
SITE CLEARING

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Site Clearing and Grubbing.
 - 2. Stripping/Topsoil Excavation.
- B. Related Sections:
 - 1. Section 02374 – Erosion Control Devices.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

- A. Site Clearing and Grubbing:
 - 1. Basis of Measurement: By the 2-dimensional acre of the original ground surface that is cleared and grubbed. Computation of the quantities of clearing and grubbing will be based on surveyed surface areas (provided by the Contractor) cleared and grubbed and will be mutually agreed to in writing by the Engineer and Contractor for each particular area.
 - 2. Basis of Payment: By the 2-dimensional acre times unit price per acre for clearing and grubbing.
 - a. Includes clearing and grubbing site and burning waste materials on-site (if local permit conditions at the time allow).
 - b. Optional bid item: includes clearing and grubbing site, loading, hauling, and removing waste materials from site.
- B. Stripping / Topsoil Excavation:
 - 1. Basis of Measurement: By the 2-dimensional acre of the original ground surface that is excavated of topsoil. Computation of the quantities of topsoil excavation will be based on surveyed surface areas (provided by the Contractor) excavated of topsoil and will be mutually agreed to in writing by the Engineer and Contractor for each particular area.
 - 2. Basis of Payment: Made at contract price per 2-dimensional acre for stripping/topsoil excavation.
 - a. Includes removal, loading, hauling, and either stockpiling material approved by the Engineer for re-use as topsoil at the designated on-site stockpile location, or removing waste materials not approved by the Engineer for re-use as topsoil from site (unless permitted to dispose of on site by Owner).

1.3 SUBMITTALS

- A. N/A

1.4 QUALITY ASSURANCE

- A. Perform Work in accordance with State and local standards and ordinances.
- B. Conform to applicable codes for environmental requirements, disposal of debris, and burning debris on site (if allowed by OWNER).

PART 2 PRODUCTS

2.1 MATERIALS

- A. N/A

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify existing plant life designated to remain is tagged or identified.
- B. Identify topsoil stockpile area and waste area for materials not approved for re-use as topsoil. May dispose on site if permitted by Owner in Owner designated area.

3.2 PREPARATION

- A. Call Local Utility Line Information service not less than three working days before performing Work.
 - 1. Request underground utilities to be located and marked within and surrounding construction areas.

3.3 PROTECTION

- A. Locate, identify, and protect from damage utilities indicated to remain.
- B. Protect trees, plant growth, and features designated to remain as final landscaping as specified on Drawings.
- C. Protect bench marks, survey control points, groundwater monitoring wells, and existing structures from damage or displacement.

3.4 SITE CLEARING AND GRUBBING

- A. Notify Engineer prior to commencing with clearing activities.
- B. Install erosion control devices as shown on the Drawings and as specified in Section 02374 – Erosion Control Devices.
- C. Clear areas required for access to site and execution of Work.
- D. Remove trees and shrubs within construction area. Remove all trash or debris. Remove all materials to a depth necessary to eliminate soils containing more than 5 percent by weight fibrous organic matter, rubbish, vegetable matter, small stones, stumps, roots, root system, or other objectionable deleterious material within the clearing limits.
- E. Clear undergrowth and deadwood.
- F. Allow inspection of cleared areas by Engineer or his representative prior to beginning other construction activities.

3.5 REMOVAL

- A. Remove debris, rock, and extracted vegetation from site. If permitted by Owner, may dispose of on-site in Owner specified location.
- B. Remove construction debris and other materials that can not be used in earthwork construction or final vegetation. Materials shall be disposed off-site unless permitted by Owner to dispose of on-site in Owner designated location.
- C. Do not burn or bury materials on-site unless permitted by State and local ordinances and laws and given permission by Owner to do so. Leave site in clean condition.

3.6 STRIPPING/TOPSOIL EXCAVATION

- A. Excavate topsoil from areas to be further excavated, or re-graded without mixing with foreign materials for use in finish grading. The minimum topsoil stripping depth shall be twelve inches or as determined by the Engineer.
- B. Stockpile material at the designated on-site stockpile location and protect from erosion.
- C. Remove excess topsoil not intended for reuse, from site unless permitted by owner to dispose of on-site in Owner designated location.

END OF SECTION

SECTION 02315 EXCAVATION

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Excavating Unsuitable Material (Undercut).
- B. Related Sections:
 - 1. Section 02230 – Site Clearing.
 - 2. Section 02320 – Backfill – Structural.
 - 3. Section 02374 – Erosion Control Devices.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

- A. Excavating Unsuitable Material (Undercut):
 - 1. Basis of Measurement: By the cubic yard.
 - a. The quantity of undercutting will be based upon survey information collected before and after the undercut. See Part 1.2 A.2.a above.
 - b. In the case of small volume areas of undercutting, it will be acceptable to use an average depth times area volume computation, if both the Contractor and Owner agree prior to measurement. Both the Contractor and Owner or his designee should be represented when average depth measurements are made.
 - c. Unsuitable materials shall be removed to the satisfaction of the Engineer.
 - 2. Basis of Payment: By the cubic yard of undercut times the unit price for undercut.
 - a. Includes excavating to required elevations, and any and all necessary de-watering during excavation.
 - b. Requested payment quantities will be submitted by the Contractor with final approval by the Engineer. If a dispute exists relative to payment quantities, the Contractor at his expense will uncover any buried or covered material for re-evaluation.

1.3 SUBMITTALS

- A. N/A.

PART 2 PRODUCTS

2.1 N/A.

PART 3 EXECUTION

3.1 PREPARATION

- A. Call Local Utility Line Information service not less than three working days before performing Work.
 - 1. Have the underground utilities to be located and marked within and surrounding construction areas.

- B. The Contractor shall protect all existing facilities, including, but not limited to existing electrical lines and poles, and monitoring wells during excavations and stockpiling. Damaged facilities shall be promptly replaced at the Contractor's expense.
- C. Notify utility company to remove and relocate any utilities.
- D. Perform site clearing, grubbing, rotary mowing, necessary surveys, and topsoil excavation per Section 02230 – Site Clearing. Any depths of removal of twelve inches or less shall be considered Site Clearing and Grubbing.
- E. Identify required lines, levels, contours, and datum locations.
- F. Protect bench marks, survey control points, and existing structures from excavating equipment and vehicular traffic.

3.2 EXCAVATION

- A. Install erosion control measures as specified on the Drawings.
- B. Remove lumped subsoil, boulders, and rock.
- C. Notify Engineer of unexpected subsurface conditions and discontinue affected Work in area until notified to resume Work.
- D. Materials determined unsuitable by the Engineer shall be excavated from a depth of 12 inches below the existing ground surface within the area, the area 10 feet beyond the area and any other area designated by the Engineer. (Depths of removal of 12 inches or less in areas designated above shall be considered stripping.) The lateral extent and required depth of undercutting will be determined by the Engineer.
- E. Excavated unsuitable areas shall be replaced with structural fill, lean concrete, or aggregate as recommended by the Engineer.
- F. If necessary, the area of excavation/undercutting shall be dewatered to a depth of at least two feet below the bottom of the excavation and shall be maintained in the dewatered condition until compacted earth fill is placed to at least three feet above the original water level or to original ground level, whichever is higher.
- G. Perform temporary dewatering as necessary during excavation to minimize softening of exposed subgrade soils. A temporary sump may be constructed for accumulation of impounded waters resulting from rain or seepage. A pump with adequate capacity shall be provided and operated to maintain a low water level in the sump.
- H. Correct over-excavated areas with select backfill and compact replacement as specified for authorized excavation per Section 02320 – Backfill - Structural. No payment will be made for over-excavation or corrections made to over-excavated areas.
- I. All reconditioning of structural fill to obtain the required compaction will be the responsibility of the Contractor.
- J. Furnish all labor, materials, supervision, and equipment required for constructing and maintaining temporary diversion measures as required for construction of the landfill and all structures. Furnish, install, maintain, and operate all pumping equipment for diversion or removal of water and maintaining the work area free from water throughout construction including temporary ditches and sump construction.

- K. Protect and or divert stormwater flows from the work area utilizing Stormwater and Erosion Control Structures referenced in Section 02374.
- L. Provide survey information before and after excavation.

3.3 FIELD QUALITY CONTROL

- A. Request visual inspection of bearing surfaces by Engineer before installing subsequent work.

3.4 PROTECTION

- A. Prevent displacement or loose soil from falling into excavation; maintain soil stability.
- B. Protect bottom of excavations and soil adjacent to and beneath structures from freezing.
- C. Protect structures, utilities and other facilities from damage caused by settlement, lateral movement, undermining, stormwater, groundwater and other hazards created by earth operations.
- D. Grade top perimeter of excavation to prevent surface water from draining into excavation.
- E. Protect outlet of excavations from potential sediment deposit by placing sediment control measures such as silt fence and/or temporary sediment traps.

END OF SECTION

SECTION 02320
BACKFILL - STRUCTURAL

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Fill Type S1, structural fill, defined as compacted fill for perimeter berms, surface water control systems, roadways, area fill not within the landfill cells, or other systems not intended to function as a migration barrier. Any fill material containing ash will not be considered as Fill Type S1.
 - 2. Fill Type S2, subgrade fill, defined as compacted fill placed to achieve proposed liner system subgrade elevations. Fill Type S2 may include fill material containing ash.
 - 3. Fill Type S5, topsoil/vegetative soil, defined as soil material capable of sustaining vegetation as specified in these Specifications.
 - 4. Dust Control
- B. Related Sections:

Not Used.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

- A. Fill Type S1, Structural Fill:
 - 1. Basis of Measurement: By the cubic yard filled or as otherwise agreed to by the Owner and Contractor. For the cubic yard filled, the quantity of structural fill will be based upon the in-place volume between the excavated surface or prepared subgrade and the structurally filled surface as determined by the difference between two topographic surveys. A grid pattern as approved by the Engineer of ground surface elevations in the area shall be surveyed and reference points installed by the Earthwork Contractor prior to structural backfill placement and prior to placement of any overlying material. The Engineer shall check the as-built finished grades and determine the backfilled volume of ash based on survey data provided by the Earthwork Contractor. Survey for measurement and payment shall be performed by a licensed professional land surveyor, independent of the Contractor.
 - 2. Basis of Payment: By the cubic yard placed times the unit price for fill Type S1 placement.
 - a. Includes borrow excavation, hauling, scraping, stockpiling, dust control, scarifying substrate surface, moisture conditioning, placing where required, compacting, maintenance, and removing accumulated water during construction.
 - b. Requested payment quantities will be submitted by the Contractor with final approval by the Engineer. If a dispute exists relative to payment quantities, the Earthwork Contractor, at his expense, will uncover any buried or covered material for re-evaluation by the Owner or Engineer.
- B. Fill Type S2, Subgrade Fill:
 - 1. Basis of Measurement: By the cubic yard filled or as otherwise agreed to by the Owner and Contractor. For the cubic yard filled, the quantity of structural fill will be based upon the in-place volume between the excavated surface or prepared subgrade and the structurally filled surface as determined by the difference between two topographic surveys. A grid pattern as approved by the Engineer of ground surface elevations in the area shall be surveyed and reference points installed by the Earthwork Contractor prior to structural backfill placement and prior to placement of any overlying material. The Engineer shall

check the as-built finished grades and determine the backfilled volume of ash based on survey data provided by the Contractor. Survey for measurement and payment shall be performed by a licensed professional land surveyor, independent of the Contractor.

2. Basis of Payment: by the cubic yard placed times the unit price for fill Type S2 placement.
 - a. For ash includes excavation and removal from active ash basin and/or reshaping of existing grade, hauling, scraping, stockpiling, dust control, scarifying substrate surface, moisture conditioning, placing where required, compacting, maintenance, and removing accumulated water during construction.
 - b. For natural soil materials includes borrow area excavation and removal, hauling, scraping, stockpiling, dust control, scarifying substrate surface, moisture conditioning, placing where required, compacting, maintenance, and removing accumulated water during construction.
 - c. Requested payment quantities will be submitted by the Contractor with final approval by the Engineer. If a dispute exists relative to payment quantities, the Contractor, at his expense, will uncover any buried or covered material for re-evaluation by the Owner or Engineer.
- C. Fill Type S5, Topsoil:
1. Basis of Measurement: By the cubic yard filled or as otherwise agreed to by the Owner and Contractor. For the cubic yard filled as determined by the difference between the Subgrade Survey and the As-Built Survey.
 2. Basis of Payment: By the cubic yard placed times the unit price for fill Type S5 placement.
 - a. Includes borrow excavation and/or furnishing, hauling, scraping, scarifying fill material, placing, compacting, and maintenance of topsoil.
 - b. Requested payment quantities will be submitted by the Contractor with final approval by the Engineer. If a dispute exists relative to payment quantities, the Contractor, at his expense, will uncover any buried or covered material for re-evaluation by the Owner or Engineer.
- D. Dust Control:
1. Basis of Measurement: Lump sum.
 2. Basis of Payment: Lump sum.
 - a. Includes labor and materials for performance of providing dust control to meet the requirements of the approved Dust Control Plan for the existing Cells 1 and 2 as directed by Duke Energy.

1.3 REFERENCES

- A. ASTM D422 - Standard test Method for Particle-Size Analysis of Soils (Grain Size with Hydrometer).
- B. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³).
- C. ASTM D1556 – Standard Test Method for Density of Soil In Place by the Sand-Cone Method.
- D. ASTM D2216 - Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass.
- E. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

- F. ASTM D2487 – Standard Practices for Classification of Soil for Engineering Purposes (Unified Soil Classification System)
- G. ASTM D2937 - Standard Test Method for Density of Soil in place by the Drive-Cylinder Method.
- H. ASTM D4318 - Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

1.4 SUBMITTALS

Not Used.

PART 2 PRODUCTS

2.1 FILL MATERIALS

- A. Fill Type S1, Structural Fill:
 - 1. Structural fill is defined as compacted fill for perimeter berms, surface water control systems, roadways, area fill not within the landfill cells, or other systems not intended to function as a migration barrier.
 - 2. Natural soil material from designated on-site borrow areas and/or stockpiles. Any fill material containing ash shall not be considered as Type S1 Fill
 - 3. Structural fill shall be classified as SP, SM, SW, SC, SW-SM, SW-SC, SP-SM, ML, MH, or CL soils according to the Unified Soil Classification System (ASTM D2487).
 - 4. Free of topsoil, organic material, roots, stumps, brush, rocks larger than 4 inches, subsoil, debris, vegetation, and other foreign matter.
 - 5. Structural fill located within 1-foot of geosynthetics components shall have a maximum particle size of 3 inches. The material shall be screened by the Earthwork Contractor, if necessary, to remove particle sizes greater than 3 inches in diameter. No more than 5 percent of the material should be retained on the No. 4 sieve.
 - 6. All material clods will be broken down with tillers and/or discs to provide a homogeneous soil that is free of clods greater than 4 inches in diameter with no more than 15% retained on the No. 4 sieve.
- B. Fill Type S2, Subgrade Fill:
 - 1. Subgrade fill is defined as compacted fill placed to achieve proposed liner system subgrade elevations.
 - 2. May consist of fly ash from Marshall Steam Station, or other on-site sources as directed by the Engineer.
 - 3. May consist of natural soil material from designated on-site borrow areas and/or stockpiles.
 - 4. Shall be classified as SP, SM, SW, SC, SW-SM, SW-SC, SP-SM, ML, MH, or CL soils according to the Unified Soil Classification System (ASTM D2487).
 - 5. Free of topsoil, organic material, roots, stumps, brush, rocks larger than 4 inches, subsoil, debris, vegetation, and other foreign matter.
 - 6. All material clods will be broken down with tillers and/or discs to provide a homogeneous soil that is free of clay clods greater than 4 inches in diameter with no more than 15% retained on the No. 4 sieve.
- C. Fill Type S5, Topsoil/Vegetative Soil:
 - 1. Topsoil / vegetative soil is defined as compacted fill placed to achieve final grades on the final cover system or to otherwise support vegetation establishment in areas not within the landfill cells.

2. Excavated and reused materials from designated on-site or off-site borrow areas and/or stockpiles and/or approved soil from trenching operations.
3. Shall be classified as SM, SC, SW-SM, SW-SC, SP-SM, ML, MH, or CL soils according to the Unified Soil Classification System (ASTM D2487).
4. Free of roots, stumps, brush, debris, and other foreign matter.
5. Shall have no rocks protruding from topsoil surface.
6. Topsoil material shall have nutrient content and pH capable of supporting vegetation.
7. Shall have a minimum organic content of 2% by weight.
8. All material clods will be broken down with tillers and/or discs to provide a homogeneous soil that is free of clods greater than 2 inches in diameter with no more than 15% retained on the No. 4 sieve.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01300 - Administrative Requirements: Coordination and project conditions
- B. The Engineer will assist the Earthwork Contractor in the determination of Structural Fill and non-select material during excavation operations (see Section 02315). The Earthwork Contractor will be responsible for excavating, transporting, stockpiling, placing and compacting all materials as needed.

3.2 PREPARATION

- A. Prepare and compact subgrade to density requirements for subsequent backfill materials.
- B. Cut out soft areas, scarify and moisture condition, or modify areas of subgrade not capable of compaction in place as recommended by the Engineer or his representative. Backfill with Type S1 or S2 fill (as specified by the Engineer) and compact to density equal to or greater than requirements for subsequent fill material.
- C. Scarify subgrade surface to depth of 6 inches.
- D. Proof roll subgrade to identify soft spots requiring removal or modification. Place fill and compact to density equal to or greater than requirements, and within moisture range required, for subsequent fill material.
- E. Begin backfilling after acceptance of the Stripped Surface Survey.

3.3 BACKFILLING

- A. Backfill areas to contours and elevations as shown on Drawings with unfrozen materials.
- B. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen or spongy subgrade surfaces.
- C. Fill Type S1 and S2 – Soil Materials: Place and compact material in loose lifts not exceeding 8 inches in thickness and not exceeding 6 inches compacted thickness. Manually compacted fill near pipes and other structures will be placed in loose lifts not exceeding 4 to 6 inches in thickness.
- D. Fill Type S2- Subgrade Fill Ash: Place and compact material in loose lifts to achieve 12-inch compacted lift thickness.

- E. Fill Type S5: Scarify subgrade, place material in one or more lifts and track in with backhoe or other equipment approved by Engineer.
- F. Fill Type S1, backfill for drop inlets, and culverts:
 - 1. Backfill of the drop inlets and culverts shall be placed and compacted in 4 to 6 inch thick loose lifts around the drop inlets and over the culverts. Lift thickness shall be maintained for fill placed within the initial 2-ft over the culverts.
 - 2. Compaction shall be performed by hand tampers or small hand operated compactors.
- G. Employ placement method that does not disturb or damage other work.
- H. Backfill against supported structures. Do not backfill against unsupported structures.
- I. Backfill simultaneously on each side of unsupported structures until supports are in place.
- J. Protect backfill from desiccation, crusting, or cracking.
- K. Make gradual grade changes. Blend slope into level areas.
- L. Remove surplus backfill materials from site unless authorized by Owner to dispose of on-site in an Owner designated location.
- M. Leave fill material stockpile areas free of excess fill materials.
- N. Provide positive drainage in on-site borrow areas and/or stockpiles.
- O. Throughout construction, provide the necessary dust control measures to meet the requirements of the approved Dust Control Plan for the existing Cells 1 and 2.
- P. Perform Subgrade Survey before placement of overlying materials.

3.4 TOLERANCES

- A. Section 01400 - Quality Requirements: Tolerances.
- B. Finished grade for Type S1 fill shall be plus or minus 1 inch from required elevations. Finished grade for Type S2 soil materials fill shall be -1 to plus 0 inches.
- C. Finished grade for Type S2- subgrade fill ash shall be placed to plus or minus 3 inches of proposed grades as indicated on subgrade drawings.

3.5 FIELD QUALITY CONTROL

- A. The Owner's representative shall be responsible for field quality control of structural fill placement
- B. Laboratory Testing - Soil Materials
 - 1. Perform laboratory material tests in accordance with ASTM D422, ASTM D698, ASTM D2216, and ASTM D4318.
 - 2. Fill Type S2 – Subgrade Fill Ash: test at a frequency of:
 - a. 20,000 cubic yards of material placed;
 - b. When materials using for structural fill change; and/or
 - c. when directed by the Engineer.
 - d. Sample size shall be 50-lb.
 - 3. Fill Type S1 and S2 – Soil Materials test at a frequency of:

- a. 10,000 cubic yards of material placed;
 - b. When materials used for structural fill change; and/or
 - c. when directed by the Engineer.
 - d. Sample size shall be 50-lb.

- C. In Place Compaction and Natural Moisture Content Tests
 - 1. Perform in-place compaction tests in accordance with ASTM D1556, ASTM D2922, or ASTM D2937.
 - 2. Perform in-place natural moisture content test in accordance with ASTM D2216.
 - 3. Fill Type S2 – Subgrade Fill Ash: frequency of compaction/natural moisture content tests for landfill subgrade at a minimum frequency of 1 test per 5,000 in-place cubic yards (approximately 1 test per 3 acres per lift) or as otherwise indicated in these Specifications.
 - 4. Frequency of compaction/natural moisture content tests:
 - a. Area fills outside landfill cells, surface water control systems, or other systems not intended to function as a migration barrier, in-place density and moisture: Each lift at a minimum frequency of 1 per acre per lift, or as otherwise indicated in these Specifications.
 - b. Perimeter berms and roadways: Each lift at a minimum frequency of 1 per 5000 sq. ft.
 - c. Pipe backfill: Each lift at a minimum frequency of 1 per 50 linear feet.
 - 5. Landfill and Embankments:
 - a. Type S1 and S2 fill shall be compacted to minimum 95 percent of its Standard Proctor (ASTM D 698) maximum dry density.
 - b. Fill Type S5 should be placed in one continuous loose lift and tracked in by backhoe or other equipment approved by Engineer.
 - c. Compacted moisture content shall be within 3 percent of optimum moisture content for all fill placed, or as otherwise approved by Engineer.
 - 6. Drop Inlets, and Culverts:
 - a. Compaction shall be at a minimum 95 percent of the Standard Proctor maximum dry density.
 - b. Compacted moisture content shall be within 3 percent of optimum moisture content for all fill placed, or as otherwise approved by Engineer.

- D. When tests indicate Work does not meet specified requirements, remove Work, replace and retest.

3.6 PROTECTION OF FINISHED WORK

- A. Section 01700 - Execution Requirements: Protecting finished work.
- B. Reshape and re-compact fills subjected to vehicular traffic.

END OF SECTION

SECTION 02374
EROSION CONTROL DEVICES

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Channels.
 - 2. Downdrains.
 - 3. Rock Pipe Inlet Protection.
 - 4. Outlet Protection.
 - 5. Silt Fencing.
 - 6. Silt Fence Outlets.
 - 7. Check Dam.
 - 8. Straw Wattle.
 - 9. Slope Matting.
 - 10. Grassing.
 - 11. Erosion Maintenance.
 - 12. Erosion Closeout
 - 13. Post-Construction Erosion Inspections and Repair
- B. Related Sections:
 - 1. Section 02060 - Aggregate.
 - 2. Section 02230 - Site Clearing.
 - 3. Section 02320 – Backfill – Structural.
 - 4. Section 02610 – Pipe Culverts.
 - 5. Section 02674 – Nonwoven Geotextile.
 - 6. Section 02924 - Seeding and Soil Supplements.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

- A. Channels:
 - 1. Basis of Measurement: By linear foot.
 - 2. Basis of Payment: Linear footage installed times the unit price per linear foot.
 - a. Includes excavating, windrowing, placing fill, compacting, installing channel lining (erosion control matting or riprap and non-woven geotextile), maintaining during construction, seeding, and mulching for grass-lined channels as indicated on Drawings, and maintaining during construction. Refer to Section 02924 for seeding and soil supplements for grassing.
 - b. Requested payment quantities will be submitted by the Contractor with final approval by the Engineer. If a dispute exists relative to payment quantities, the Contractor at his expense will uncover any buried or covered material for re-evaluation.
- B. Downdrains:
 - 1. Basis of Measurement: By linear foot.
 - 2. Basis of Payment: Linear footage installed times the unit price per linear foot.
 - a. Includes placement, pipe materials, anchoring pipe, and maintaining during construction. Refer to Section 02610 for pipe requirements.
 - b. Requested payment quantities will be submitted by the Contractor with final approval by the Engineer. If a dispute exists relative to payment quantities, the Contractor at his expense will uncover any buried or covered material for re-evaluation.

- C. Rock Pipe Inlet Protection:
 - 1. Basis of Measurement: Each unit placed.
 - 2. Basis of Payment: Unit Price for each unit placed.
 - a. Includes labor and materials for cleaning, placing nonwoven geotextile fabric in accordance with Section 02674, placing rock, and maintaining during construction.
- D. Outlet Protection:
 - 1. Basis of Measurement: Each unit placed.
 - 2. Basis of Payment: Unit Price for each unit placed.
 - a. Includes labor and materials for cleaning, excavating, backfilling, placing embankment, placing nonwoven geotextile fabric in accordance with Section 02674, placing rock, and required grouting as indicated on Drawings, and maintaining.
- E. Silt Fencing:
 - 1. Basis of Measurement: By the linear foot.
 - 2. Basis of Payment: Unit Price for each linear foot placed.
 - a. Includes labor and materials for furnishing, installing, and maintaining during construction.
- F. Silt Fence Outlets:
 - 1. Basis of Measurement: Each unit placed.
 - 2. Basis of Payment: Unit Price for each unit placed.
 - a. Includes labor and materials for cleaning, placing rock, maintenance of silt fence outlet throughout construction including repair and replacement of aggregate if necessary, establishment of on-site aggregate stockpiles sufficient for maintenance purposes, and maintaining during construction.
- G. Check Dam:
 - 1. Basis of Measurement: Each unit placed.
 - 2. Basis of Payment: Unit Price for each unit placed.
 - a. Includes labor and materials for cleaning, excavating, backfilling, placing nonwoven geotextile fabric in accordance with Section 02674, placing rock, maintenance of check dam throughout construction including repair and replacement of aggregate if necessary, establishment of on-site aggregate stockpiles sufficient for maintenance purposes, and maintaining during construction.
- H. Straw Wattle:
 - 1. Basis of Measurement: Each unit placed.
 - 2. Basis of Payment: Unit Price for each unit placed.
 - a. Includes labor and materials for cleaning, excavating, backfilling, installing straw wattle, and maintaining during construction.
- I. Slope Matting:
 - 1. Basis of Measurement: By the square yard.
 - 2. Basis of Payment: Unit Price for each square yard placed.
 - a. Includes labor and materials for installing slope matting, and maintaining during construction.
- J. Grassing:
 - 1. Basis of Measurement: By the Acre. Refer to Section 02924.
 - 2. Basis of Payment: Unit Price for each acre seeded. Refer to Section 02924.

- K. Erosion Maintenance:
 - 1. Basis of Measurement: Lump sum.
 - 2. Basis of Payment: Lump sum
 - a. Includes labor and materials for performance of maintaining existing E&SC measures and performing all E&SC inspections as required by NCDENR throughout the construction.
- L. Erosion Closeout:
 - 1. Basis of Measurement: Lump sum.
 - 2. Basis of Payment: Lump sum
 - a. Includes labor and materials for performing an inspection 10 months after Substantial Completion (or when ground stabilization is sufficient) with the Owner and NCDENR Land Quality Section to close the Erosion and Sedimentation Control Plan and removing temporary E&SC measures and making any necessary repairs resulting from the inspection.
- M. Post-Construction Erosion Inspections and Repair:
 - 1. Basis of Measurement: Lump sum.
 - 2. Basis of Payment: Lump sum
 - a. Includes labor and materials for performing inspections at least weekly and after each 0.5-inch or greater rainfall event, as well as making any necessary repairs resulting from the inspections.

1.3 REFERENCES

- A. ASTM International:
 - 1. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)).

1.4 SUBMITTALS

- A. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.5 QUALITY ASSURANCE

- A. Perform Work in accordance with requirements of these Project Specifications.
- B. Perform Work in accordance with NCDOT standards.

1.6 PRE-INSTALLATION MEETINGS

- A. Convene minimum one week prior to commencing work of this Section.

PART 2 PRODUCTS

2.1 RIPRAP AND GEOTEXTILE MATERIALS

- A. Riprap: As shown on Drawings and as specified in Section 02060. Furnish in accordance with NCDOT standards.
- B. Geotextile Fabric: Non-biodegradable, non-woven geotextile, 8 oz/sy, UV stabilized filter fabric as specified in Section 02674.

2.2 MATTING

- A. Matting: As shown on Drawings.

2.3 DOWNDRAINS

- A. Refer to Section 02610.

2.4 AGGREGATE AND SOIL MATERIALS

- A. Fine and Coarse Aggregate: As shown on Drawings and as specified in Section 02060.
- B. Soil Backfill: Soil Type S1 as specified in Section 02320. Subsoil with no rocks over 4 inches in diameter, frozen earth or foreign matter.

2.5 SILT FENCING

- A. As specified on Drawings.

2.6 PLANTING MATERIALS

- A. Seeding and Soil Supplements: As specified in Section 02924.
- B. Mulch: As specified in Section 02924.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify compacted subgrade or granular base is acceptable and ready to support devices and imposed loads.
- B. Verify gradients and elevations of base or foundation for other work are correct.

3.2 CHANNELS

- A. Windrow excavated material on low side of channel.
- B. Place fill and compact to 95 percent of the maximum dry density as determined by ASTM D698.
- C. On entire channel area, apply soil supplements and sow seed as specified in Section 02924.
- D. Mulch seeded areas with straw as specified in Section 02924.
- E. Install channel lining as specified on Drawings.

3.3 OUTLET PROTECTION

- A. Excavate to indicated depth of rock lining or nominal placement thickness as indicated on Drawings. Remove loose, unsuitable material below bottom of rock lining, then replace with suitable material. Thoroughly compact and finish entire foundation area to firm, even surface.
- B. Lay and overlay geotextile fabric over substrate. Lay fabric parallel to flow from upstream to downstream. Overlap edges upstream over downstream and upslope over downslope. Provide a

minimum overlap of 2 feet. Offset adjacent roll ends a minimum of 5 feet when lapped. Cover fabric as soon as possible and in no case leave fabric exposed more than 4 weeks.

- C. Carefully place rock on geotextile fabric to produce an even distribution of pieces, with minimum of voids and without tearing geotextile. Place as indicated on Drawings.
- D. Unless indicated otherwise, place full course thickness in one operation to prevent segregation and to avoid displacement of underlying material. Arrange individual rocks for uniform distribution. Place evenly and carefully to minimize voids.
 - 1. Saturate rock with water and let all standing water drain. Fill voids between pieces with grout, where shown on Drawings, for at least top 6 inches. Sweep surface with stiff broom to remove excess grout.

3.4 SILT FENCING

- A. Install as specified on Drawings.

3.5 SILT FENCE OUTLETS

- A. Locations as indicated on the Drawings and may be field-adjusted with Engineer's approval.

3.6 SITE STABILIZATION

- A. Incorporate erosion control devices indicated on Drawings into the Project at the earliest practicable time.
- B. Construct, stabilize and activate erosion controls before site disturbance within tributary areas of those controls.
- C. Stockpile and waste pile heights shall not exceed heights indicated on the drawings. Slope stockpile sides at 2(H): 1(V) or flatter or as otherwise indicated on the Drawings. Stockpiles shall be graded to promote positive drainage.
- D. Stabilize any disturbed areas as specified in the seeding specifications.
 - 1. During non-germinating periods, apply mulch at recommended rates.
 - 2. Stabilize disturbed areas which are not at finished grade and which will be disturbed within one year in accordance with Section 02924 and as specified on Drawings for temporary seeding.
 - 3. Stabilize disturbed areas which are either at finished grade or will not be disturbed within one year in accordance with Section 02924 permanent seeding specifications.
- E. Stabilize diversion channels and stockpiles immediately.

3.7 FIELD QUALITY CONTROL

- A. Inspect erosion control devices on a weekly basis and after each runoff event in accordance with applicable North Carolina regulations. Perform additional inspections as required by the Self-Inspection Program. Make necessary repairs to ensure erosion and sediment controls are in good working order.
- B. Compaction Testing: As specified in Section 02320.
- C. When tests indicate work does not meet specified requirements, remove work, replace and retest.

3.8 CLEANING

- A. Remove and dispose of sediment when sediment accumulation in sedimentation structures has reached a point one-half depth of sediment structure or device, or as indicated on the Drawings.
- B. Do not damage structure or device during cleaning operations. Any damage caused by cleaning operations shall be repaired at no cost to the Owner.
- C. Do not permit sediment to erode into construction or site areas or natural waterways.
- D. Clean channels when depth of sediment reaches approximately one half channel depth.
- E. Do not damage channel or channel lining material during cleaning operations.

3.9 SCHEDULES

- A. As indicated on Drawings.

END OF SECTION

SECTION 02610 PIPE CULVERTS

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. HDPE corrugated, smooth interior stormwater pipe.
 - 2. Joints and accessories.
- B. Related Sections
 - 1. Section 02374 – Erosion Control Devices.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

- A. Pipe Culvert:
 - 1. Basis of Measurement: Included with Section 02374.
 - 2. Basis of Payment: Included with Section 02374.

1.3 REFERENCES

- A. American Society for Testing and Materials:
 - 1. ASTM D2321 – Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity Flow Applications.
 - 2. ASTM F405 – Standard Specification for Corrugated Polyethylene Pipe and Fittings.
 - 3. ASTM F667 – Standard Specification for Large Diameter Corrugated Polyethylene Pipe and Fittings.

1.4 SUBMITTALS

- A. Product Data: Submit data on pipe, fittings and accessories.
- B. Manufacturer's Installation Instructions: Submit special procedures required to install Products specified.

1.5 CLOSEOUT SUBMITTALS

- A. Project Record Documents: Record location of pipe runs, connections, and invert elevations via survey information.

PART 2 PRODUCTS

2.1 HDPE Corrugated Stormwater Pipe

- A. Stormwater pipe shall be HDPE corrugated, smooth interior pipe as manufactured by ADS (N-12) or engineer approved equivalent, meeting the requirements of ASTM F405 and ASTM F667 or as otherwise shown on the drawings.

PART 3 EXECUTION

3.1 PREPARATION

- A. Excavate pipe trench. Hand trim excavation for accurate placement of pipe to elevations indicated.

- B. Verify trench cut is ready to receive work and excavations, dimensions, and elevations are as indicated on drawings.
- C. Perform temporary dewatering as necessary to keep bearing soils from softening.
- D. Remove large stones or other hard matter which could damage piping or impede consistent backfilling or compaction.

3.2 INSTALLATION - PIPE

- A. Place pipe in trench and ensure pipe remains in correct position and to required slope with necessary support.
- B. Install backfill at sides and over top of pipe. Install top cover to minimum compacted thickness of 18 inches.
- C. Refer to Section 02320 for backfilling and compacting requirements. Do not displace or damage pipe when compacting.
- D. Installation of HDPE pipe shall be in accordance with ASTM D2321, the manufacturer's recommendations, and as described elsewhere in these specifications.
- E. Install pipe anchoring as indicated on the drawings.

3.3 ERECTION TOLERANCES

- A. Lay pipe to alignment and slope gradients noted on Drawings; with maximum variation from indicated slope of 1/8 inch in 10 feet.
- B. Maximum variation from intended elevation of culvert invert: 1/2 inch.
- C. Maximum offset of pipe from indicated alignment: 1 inch.
- D. Maximum variation in profile of structure from Intended Position: 1/2 percent.

3.4 FIELD QUALITY CONTROL

- A. Request inspection prior to placing backfill over pipe.
- B. Compaction Testing: In accordance with Section 02320.
- C. When tests indicate Work does not meet specified requirements, remove Work, replace and retest.

3.5 PROTECTION OF INSTALLED CONSTRUCTION

- A. Protect pipe and cradle from damage or displacement until backfilling operation is in progress.

END OF SECTION

SECTION 02674
NONWOVEN GEOTEXTILES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Nonwoven geotextile for:
 - a. Sub-base for outlet protection.
- B. Related Sections:
 - 1. Section 02060 – Aggregate.
 - 2. Section 02374 – Erosion Control Devices.

1.2 UNIT PRICE – MEASUREMENT AND PAYMENT

- A. Geotextile
 - 1. Basis of Measurement: Included with Section 02374.
 - 2. Basis of Payment: Included with Section 02374.

1.3 REFERENCES:

- A. American Society for Testing and Materials (ASTM) standards
 - 1. ASTM D698 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12 400 ft-lbf/ft³ (600 kN-m/m³)).
 - 2. ASTM D3786 Standard Test Method for Hydraulic Burst Strength of Knitted Goods and Non-woven Fabrics (Diaphragm Bursting Strength Tester Method).
 - 3. ASTM D4354 Practice for Sampling of Geosynthetics for Testing.
 - 4. ASTM D4355 Test Method for Deterioration of Geotextiles from Exposure to Ultraviolet Light and Water (Xenon-Arc Type Apparatus).
 - 5. ASTM D4491 Standard Test Method for Water Permeability of Geotextiles by Permittivity.
 - 6. ASTM D4751 Standard Test Method for Determining Apparent Opening Size of a Geotextile.
 - 7. ASTM D4533 Test Method for Trapezoidal Tearing Strength of Geotextiles.
 - 8. ASTM D4632 Test Method for Grab Breaking Load and Elongation of Geotextiles.
 - 9. ASTM D4759 Practice for Determining the Specification Conformance of Geosynthetics.
 - 10. ASTM D4873 Guide for Identification, Storage and Handling of Geotextiles.
 - 11. ASTM D5261 Test Method for Measuring Mass per Unit Area of Geotextiles.
 - 12. ASTM D5321 Standard Test Method for Determining the Coefficient of Soil and Geosynthetic or Geosynthetic and Geosynthetic Friction by the Direct Shear Method.
 - 13. ASTM D6241 Standard Test Method for the Static Puncture Strength of Geotextiles and Geotextile-Related Products Using a 50-mm Probe.

1.4 SUBMITTALS

- A. Manufacturer's Product Information
 - 1. As part of their bid, the Contractor shall submit for the geotextile to be used:
 - a. Name of manufacturer.
 - b. Product name.
 - c. Style number.
 - d. Chemical composition of the filaments and yarns.

- e. Product data sheets.
 - f. Manufacturer's installation instructions.
2. Submit the results of factory testing to the Construction Quality Control Office (CQAO) prior to initiating field work.
3. A written certificate from the Geotextile Manufacturer stating that the materials supplied are in compliance with this Specification:
 - a. The manufacturer's certificate shall state that the finished geotextile meets MARV requirements of the specification as evaluated under the manufacturer's quality control program and that these values are guaranteed by the geotextile manufacturer.
 - b. The information supplied shall be in the form of a factory quality control certificate for each roll and shall include the following:
 - 1) Lot, batch, or roll numbers and identification.
 - 2) Length and width of each roll.
 - 3) Date each roll was manufactured.
 - 4) Sampling procedures.
 - 5) Geotextile must meet the minimum required physical properties for geotextile specified in Table 02674-A found in this Section 02674.
 - c. A person having legal authority to bind the manufacturer shall attest to the certificate.
4. Either mislabeling or misrepresentation of materials shall be reason to reject those geotextile products.

1.5 QUALITY ASSURANCE

- A. Perform Work in accordance with these Specifications.
- B. Any geotextile sample that does not comply with this Section 02674 shall result in rejection of the roll from which the sample was obtained. The Contractor shall replace any rejected rolls at no additional cost to Owner.
- C. If a geotextile sample fails to meet the quality control requirements of this Section 02674, the Contractor shall require that the Geotextile Manufacturer sample and test each roll manufactured in the same lot or batch, or at the same time, as the failing roll. Sampling and testing of rolls shall continue until a pattern of acceptable test results is established.
- D. General manufacturing procedures shall be performed in accordance with the manufacturer's internal quality control guide and/or documents.
- E. The Manufacturer shall be a well-established firm with more than two years experience in the manufacture of geotextiles.
- F. The Contractor shall be trained and qualified to install geotextiles.
- G. The engineer shall monitor the geotextile rolls upon delivery to the site and report any deviations from project specifications to the Contractor.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Geotextile labeling, shipment, and storage shall follow ASTM D 4873.
- B. Product labels shall clearly show:
 1. Manufacturer or supplier name.
 2. Product identification.
 3. Lot or batch number.
 4. Roll number.

5. Roll dimensions (length and width).
 - C. If any special handling is required, it shall be so marked on the geotextile itself; e.g., "This Side Up" or "This Side Against Soil to be Retained."
 - D. Each shipping document shall include a notation certifying that the material is in accordance with the manufacturer's certificate.
 - E. Each geotextile roll shall be wrapped with a material that will protect the geotextile, including the ends of the roll, from damage due to shipment, water, ultraviolet sunlight, mud, dust, puncture, and other damaging deleterious conditions. The protective wrapping shall be maintained during periods of shipment and storage.
 - F. During storage, geotextile rolls shall be elevated off the ground and adequately covered to protect them from the following: site construction damage, precipitation, extended ultraviolet radiation including sunlight, chemicals that are strong acids or strong bases, flames including welding sparks, temperatures in excess of 160°F (71°C), and any other environmental condition that may damage the property values of the geotextile.
 - G. Transport and handle geotextile with equipment designed to protect it from damage. Equipment used to unload, stack or transport geotextile shall not damage protective wrap or geotextile.
 - H. Upon delivery at the job site, the Contractor shall ensure that the geotextile rolls are handled and stored in accordance with the manufacturer's instructions as to prevent damage.
 - I. The geotextile rolls shall not be stacked more than three rolls high or as otherwise recommended by the Manufacturer.
 - J. Do not use materials damaged during storage or handling. If the geotextile is not packaged and a roll is damaged during shipment, it shall be rejected.
 - K. If only the outermost surface of the roll is affected, it may be peeled back, cut, and wasted if approved by the Engineer (i.e., it shall be treated as if it were the protective packaging for the remainder of the roll).
 - L. The geotextile shall be relatively free of holes or any sign of contamination by foreign matter. The Engineer may reject all or portions of units (or rolls) of the geotextile if in his opinion significant quantities of production flaws are observed.
 - M. The Contractor shall take any necessary precautions to prevent damage to other portions of the Work during placement of the geotextile.
- 1.7 ENVIRONMENTAL REQUIREMENTS
 - A. Conduct operations not to interfere with, interrupt, damage, destroy, or endanger integrity of surface or subsurface structures or utilities, and landscape in immediate or adjacent areas.

PART 2 PRODUCTS

2.1 GEOTEXTILE

- A. Nonwoven geotextile shall be that which is specified on the Drawings. Unless otherwise noted on the Drawings, geotextile suppliers shall furnish materials whose Minimum Average Roll Values

meet or exceed the criteria specified in Table 02674-B. The Manufacturer shall provide test results for these procedures, as well as a certification that the material properties meet or exceed the specified values.

1. Minimum Average Roll Value (MARV) shall be based on Manufacturer's data and shall be calculated as the mean value of the property of interest plus or minus two standard deviations, as appropriate.
 2. Where material properties vary among the machine and cross-machine directions, the MARV shall apply to the direction providing the lowest value (when a minimum is specified) or the highest value (when a maximum value is specified).
- B. The geotextiles provided by the supplier shall be stock products.
- C. The geotextile shall be:
1. Nonwoven, needlepunched, continuous filament polyester material; or
 2. Nonwoven, needlepunched, continuous filament polypropylene material; or
 3. Nonwoven, needlepunched, polypropylene staple or continuous fiber material.
- D. The geotextile shall be manufactured from first quality virgin polymer.
- E. The supplier shall not furnish products specifically manufactured to meet the specifications of this project unless authorized by the Owner and Engineer.
- F. In addition to the property values listed in Table 02674-B, the geotextiles shall:
1. Retain its structure during handling, placement, and long-term service.
 2. Be capable of withstanding outdoor exposure for a minimum of 30 days with no measurable deterioration.

TABLE 02674-A
GEOTEXTILE REQUIRED PHYSICAL AND HYDRAULIC PROPERTIES

PROPERTIES AND REQUIREMENTS ^(1,2)	UNITS	SPECIFIED VALUES 6 oz.	SPECIFIED VALUES 8 oz.	SPECIFIED VALUES 10 oz.	SPECIFIED VALUES 12 oz.	TEST METHOD
Type	---	Nonwoven	Nonwoven	Nonwoven	Nonwoven	---
Mass Per Unit Area	oz/yd ²	6.0	8.0	10.0	12.0	ASTM D5261
Grab Tensile Strength	lb	160	200	230	300	ASTM D4632
Grab Tensile Elongation	%	50	50	50	50	ASTM D4632
Trapezoid Tear Strength	lb	65	80	95	115	ASTM D4533
CBR Puncture Strength	lb	410	500	700	800	ASTM D6241
Apparent Opening Size (AOS)	US Sieve/ mm	70/0.212	80/0.18	100/0.15	100/0.15	ASTM D4751
Permittivity	sec ⁻¹	1.5	1.4	0.8	0.8	ASTM D4491
UV Resistance ⁽³⁾	% strength retained	70	70	70	70	ASTM D4355

Notes:

- (1) All values represent minimum average roll values except for UV resistance, which is a minimum value.
- (2) Polymer composition of 95 % polypropylene or polyester by weight
- (3) Evaluation to be on 2.0 inch strip tensile specimen after 500 hours of exposure.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Prior to implementing any geotextile work, the Contractor shall carefully inspect the subgrade and verify that all work is complete to the point where the installation of the geotextile may properly commence without adverse impact.
- B. If the Contractor has any concerns regarding the installed work, the Engineer and/or Owner shall be notified in writing within 48-hours of his site inspection. Failure to inform the Engineer and/or Owner in writing of installation of the geotextile will be construed as Contractor's acceptance of all prior related work.
- C. Any geotextile that does not comply with Table 02674-B of this Section 02674 shall be rejected and replaced with new material in accordance with the Specifications, at no additional cost to Owner.

3.2 PREPARATION

- A. Prior to implementing any of the work described in this Section 02674, the Contractor shall become thoroughly familiar with all portions of the work within this Section 02674 or related work, as necessary for successful completion of the Work.

3.3 INSTALLATION

- A. The Contractor shall handle all geotextile in such a manner as to ensure they are not damaged in any way.
- B. The Contractor shall take any necessary precautions to prevent damage to underlying layers during placement of the geotextile.

3.4 FIELD QUALITY CONTROL

- A. The finished geotextile shall have good appearance qualities. It shall be free from such defects that would affect the specific properties of the geotextile, or its proper functioning.
- B. Defects and Repairs:
 - 1. Any holes or tears in the geotextile shall be repaired with a patch made from the same geotextile. The patch shall be sewn in place with a minimum of 12 inches overlap in all directions.
 - 2. Care shall be taken to remove any soil or other material, which may have penetrated the torn geotextile.

3.5 PROTECTION OF FINISHED WORK

- A. The Contractor shall use all means necessary to protect all prior work and all materials and completed work of other Sections.
- B. The geotextile shall be covered as soon as possible after installation and approval. The geotextile shall not be exposed to precipitation prior to being installed and shall not be exposed to direct sun light for more than 20 days after installation.
- C. Placement of Overlying Material:
 - 1. Placement of the overlying material shall proceed immediately following placement and inspection of the geotextile
 - 2. The overlying material shall be placed on the geotextile in such a manner that ensures that:
 - a. The geotextile and underlying lining materials are not damaged.
 - b. Minimal slippage occurs between the geotextile and underlying layers.
 - c. Wrinkling of geosynthetics does not occur.
- D. In the event of damage, the Contractor shall immediately make all repairs and replacements necessary at the expense of the responsible party, to the approval of the Engineer.
- E. Protect installed geotextile according to manufacturer's instructions. Repair or replace areas of damaged by scuffing, punctures, traffic, rough subgrade, or other unacceptable conditions.
- F. The Contractor shall not use heavy equipment to traffic above the geotextile without approved protection.

END OF SECTION

SECTION 02924
SEEDING AND SOIL SUPPLEMENTS

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Preparation of subsoil.
 - 2. Placing topsoil as needed.
 - 3. Seeding.
 - 4. Hydroseeding.
 - 5. Mulching.
 - 6. Fertilizing.
 - 7. Maintenance.
- B. Related Sections:
 - 1. Section 02320 – Backfill - Structural.
 - 2. Section 02374 – Erosion Control Devices.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

- A. Seeding:
 - 1. Basis of Measurement: By the acre.
 - 2. Basis of Payment: By the 2-dimensional acre seeded times the unit price for seeding.
 - a. Includes all labor, equipment and materials required to establish a permanent grass cover on all graded surfaces including, but not limited to preparation of subsoil, soil amendments, installation of erosion control matting, fertilizing, and seeding.
 - b. Includes fulfilling requirements of the maintenance agreement.
 - c. Includes any maintenance and protection required to control erosion on embankment fill surfaces prior to beginning permanent grassing operations.

1.3 REFERENCES

- A. The State of North Carolina Erosion and Sediment Control Planning and Design Manual.

1.4 DEFINITIONS

- A. Weeds: Vegetative species other than specified species to be established in given area.

1.5 SUBMITTALS

- A. Product Data: Submit data for seed mix, fertilizer, mulch, and other accessories.
- B. Soil test results and fertilizer and soil amendment recommendations from the North Carolina Department of Agriculture and Consumer Affairs or a similar soil and nutrient testing laboratory.

1.6 CLOSEOUT SUBMITTALS

- A. Seeding maintenance warranty.

1.7 QUALITY ASSURANCE

- A. Provide seed mixture in containers showing percentage of seed mix, germination percentage, inert matter percentage, weed percentage, year of production, net weight, date of packaging, and location of packaging.
- B. Perform Work in accordance with North Carolina Erosion and Sedimentation Control Planning and Design Manual.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver grass seed mixture in sealed containers. Seed in damaged packaging is not acceptable.
- B. Deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of manufacturer.

PART 2 PRODUCTS

2.1 SEED MIXTURE

- A. Temporary Seed Mixture: As specified on Drawings.
- B. Permanent Seed Mixture: As specified on Drawings.

2.2 SOIL MATERIALS

- A. Topsoil: Excavated from site, imported, and/or a blend thereof reasonably free of weeds as specified in Section 02320.

2.3 ACCESSORIES

- A. Mulching Material: Oat or wheat straw, free from weeds, foreign matter detrimental to plant life, and dry and as described in the North Carolina Erosion and Sediment Control Planning and Design Manual.
- B. Fertilizer: Commercial grade; recommended for grass; of proportion necessary to eliminate deficiencies of topsoil as described in the North Carolina Erosion and Sediment Control Planning and Design Manual and as indicated by soil test results.
- C. Lime: Agricultural grade; recommended for grass; of proportion necessary to promote germination of seed as described in the North Carolina Erosion and Sediment Control Planning and Design Manual and as indicated by soil test results.
- D. Water: Clean, fresh and free of substances or matter capable of inhibiting vigorous growth of grass.
- E. Erosion Fabric: Erosion control matting, as specified by the Engineer.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify prepared soil base is ready to receive the Work of this Section.

3.2 PREPARATION OF SUBSOIL

- A. Prepare sub-soil to eliminate uneven areas and low spots. Maintain lines, levels, profiles and contours. Make changes in grade gradual. Blend slopes into level areas.
- B. Remove foreign materials, weeds and undesirable plants and their roots. Remove contaminated sub-soil.
- C. Tracked soil surface shall be oriented up and down slopes and not parallel to slopes to help prevent erosion.

3.3 FERTILIZING

- A. Provide minimum fertilizer, lime, and nutrient addition as recommend by soil testing results to promote vigorous vegetative growth.
- B. Apply fertilizer after smooth raking of topsoil.
- C. Mix fertilizer thoroughly into upper 2 to 4 inches of soil.
- D. Lightly water soil to aid dissipation of fertilizer. Irrigate top level of soil uniformly.

3.4 SEEDING

- A. Stabilization and/or seeding must be completed per the erosion and sediment control permit requirements.
- B. Apply seed at rate as indicated on Drawings evenly in two intersecting directions and in accordance with the North Carolina Erosion and Sediment Control Planning and Design Manual. Rake in lightly.
- C. Do not seed areas in excess of that which can be mulched on same day.
- D. Planting Season: As indicated on Drawings and in accordance with the North Carolina Erosion and Sediment Control Planning and Design Manual.
- E. Do not sow immediately following rain, when ground is too dry, or when winds are over 12 mph.
- F. Immediately following seeding, apply mulch to thickness as specified on Drawings and in accordance with the North Carolina Erosion and Sediment Control Planning and Design Manual. Maintain clear of shrubs and trees.
- G. Apply water with fine spray immediately after each area has been mulched. Saturate to 2 inches of soil.

3.5 HYDROSEEDING

- A. Apply fertilizer, mulch and seeded slurry with hydraulic seeder at rate of 2000 lbs per acre evenly in one pass.
- B. After application, apply water with fine spray immediately after each area has been hydroseeded. Saturate to 4 inches of soil and maintain moisture levels two to four inches.

3.6 MAINTENANCE WARRANTY

- A. The contractor is responsible for providing a sufficient quality vegetation consistent with the engineers approved seeding mixture. The contractor shall be liable for maintenance, substantial growth and acceptance for a period of twelve months after Substantial Completion. The Owner shall retain a Maintenance Bond from the contractor in the amount of 15% of the total price of seeding for a period of twelve months after Substantial Completion.
- B. Vegetation shall be monitored by the Owner or Owners representative and the contractor during agreed upon dates. A corrective punch list and/or approval letter will then be formulated and given to the contractor for each review. If the vegetation is deemed of insufficient quality and/or erosion has occurred due to fault of the contractor, contractor will take corrective measures and or replace at no cost to the owner. Contractor liability for establishing vegetation does not include destructive acts by others including traffic, mowing, chemicals, all other physical activities and force majeure.
- C. Definitions:
 - 1. *corrective measures* - may include any or all of the following: re-fertilizing, re-seeding, correcting erosion issues caused by insufficient vegetation.
 - 2. *force majeure* - acts of severe or abnormal conditions including but not limited to parasitic insects or fungi, wildfire, flooding, wind damage, or extreme drought as defined by the North Carolina Drought Management Advisory Council.
 - 3. *owner's obligations* - The Owner is obligated to monitor the vegetation at the frequency defined above. If corrective measures need to be taken, the owner is responsible for communicating to the Contractor the extent and location where corrective measures are necessary.
 - 4. *sufficient quality of permanent vegetation* - Permanent vegetation will be considered of sufficient quality if the following two conditions are met:
 - a. No bare spots are larger than 25 square feet
 - b. Bare spots make up less than 2% of total seeded area
- D. Terms and conditions of the maintenance warranty may be modified by a Notice of Change if agreeable to the Owner, Engineer, and Contractor.

3.7 SCHEDULE

- A. As indicated on Drawings.

END OF SECTION